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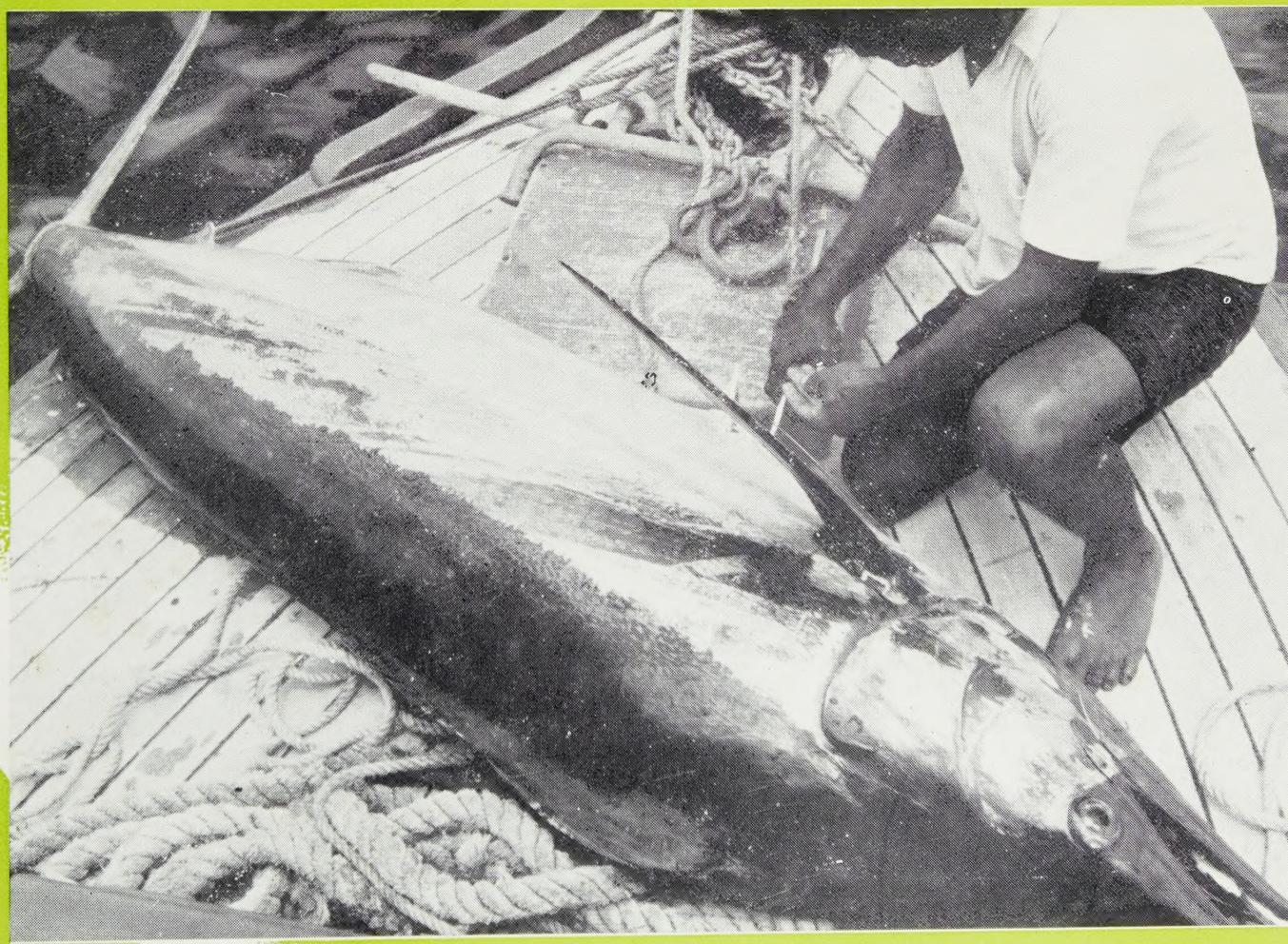

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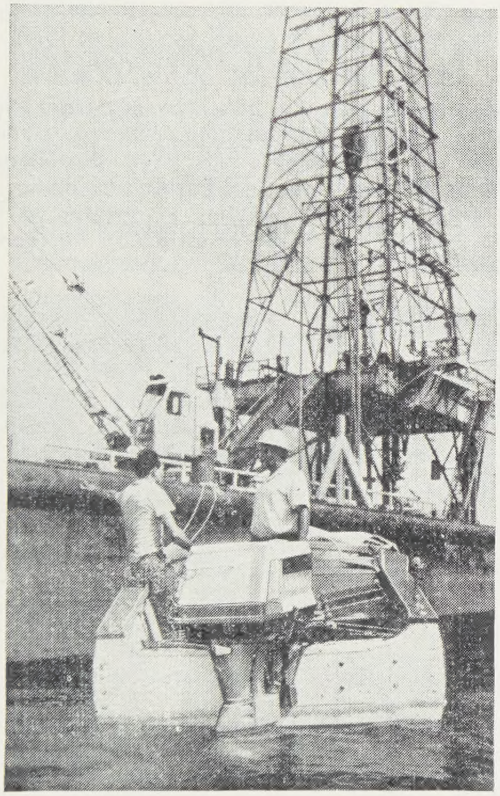

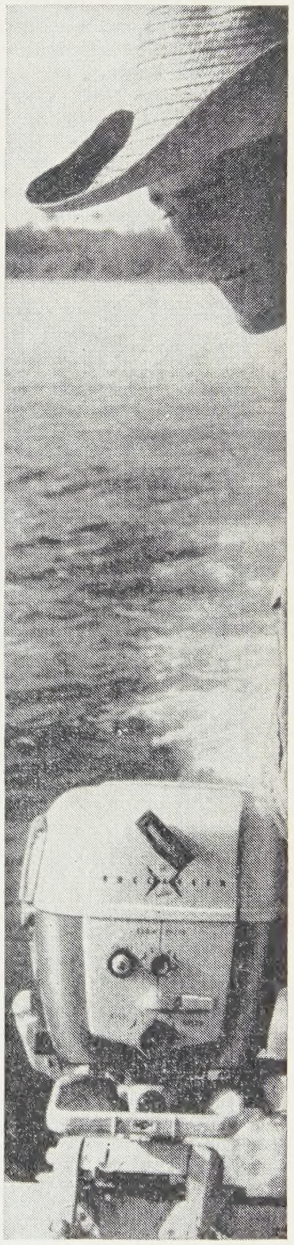

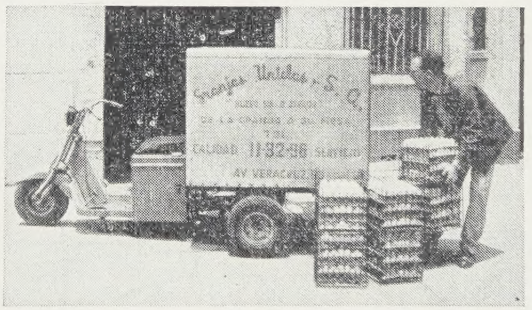

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The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of island territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to advise the participating Governments on ways of improving the well-being of the people of the Pacific island territories. It is concerned with health, economic and social matters. Its headquarters are at Nouméa, New Caledonia.

The Commission consists of not more than twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

There is a Research Council meeting once a year. This may be either a meeting of the full Council, or of one or other of its three main sections, specializing in the fields of health, economic development and social development. Members of the Research Council are appointed by the Commission. They are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission on what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

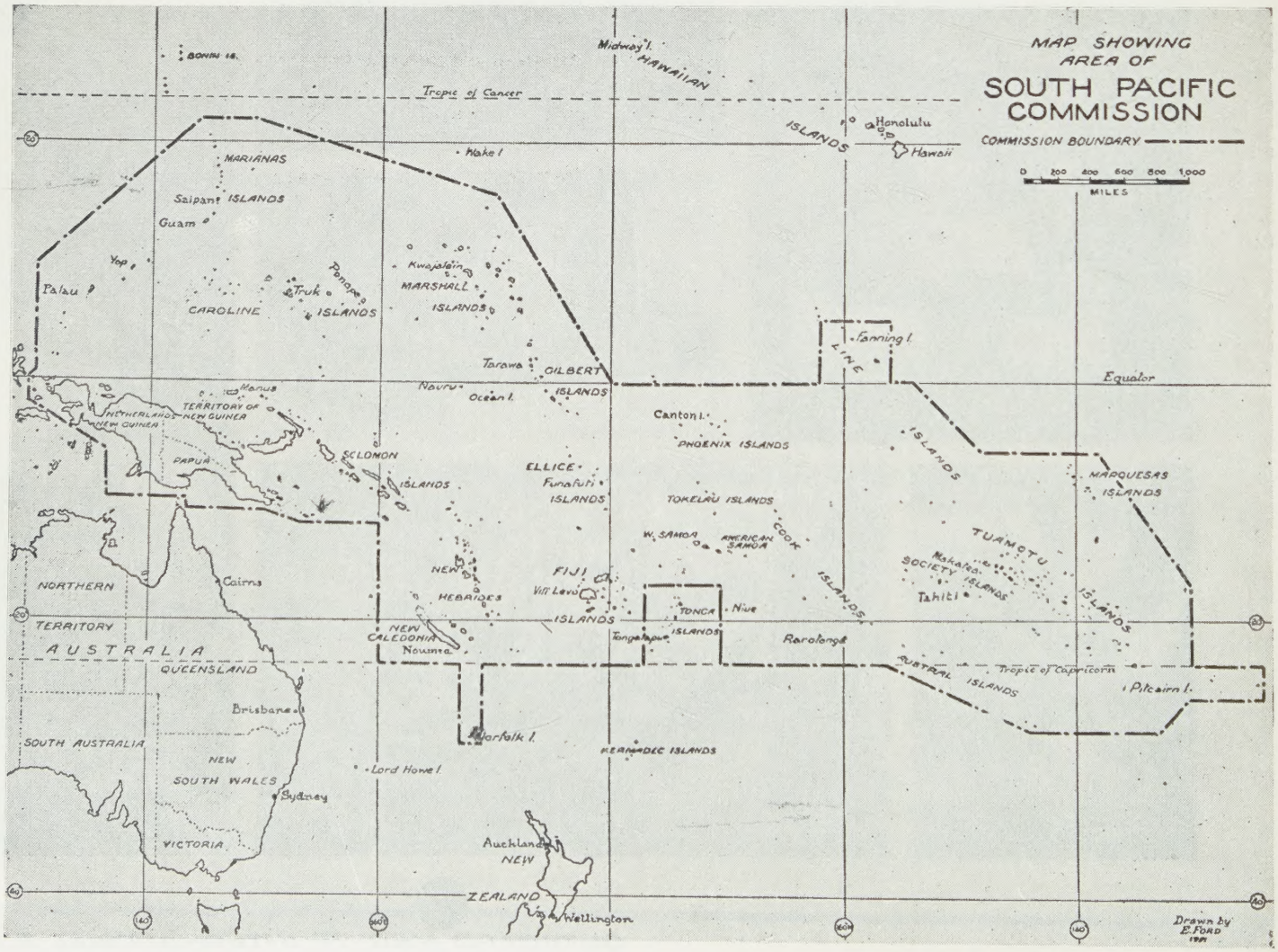
The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Fiji in April 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April 1953. The third Conference was held in Fiji in April-May 1956, and the fourth Conference in New Britain in April-May 1959.

The principal officers of the Commission are: Secretary-General, Mr. T. R. Smith; Executive Officer for Health (Acting), Dr. T. C. Lonie; Executive Officer for Economic Development, Dr. Jacques Barrau; Executive Officer for Social Development, Dr. Richard Seddon. The powers and functions of the Deputy Chairman, Research Council, are exercised by the Secretary-General.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

FRONT COVER PHOTOGRAPH

This 334-pound marlin was taken by Mr. Frank Hayford in the channel between Ovalau and Wakaya Islands in the Fiji Group. In an article in this issue, **Big-Game Fishing Would Bring World Anglers To Pacific,** the author, Mr. Rob Wright, discusses the possibilities of developing big-game fishing in the Pacific as a major attraction for tourists. (See page 27.)



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EDITOR: *A. E. Read, B.Sc.*

THE SOUTH PACIFIC BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

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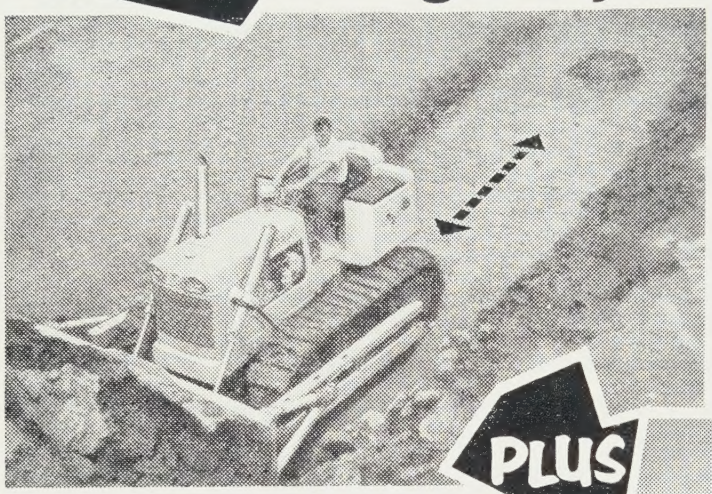

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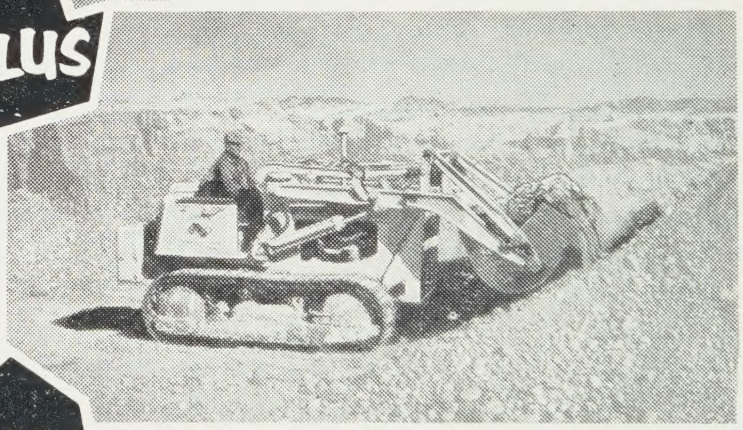

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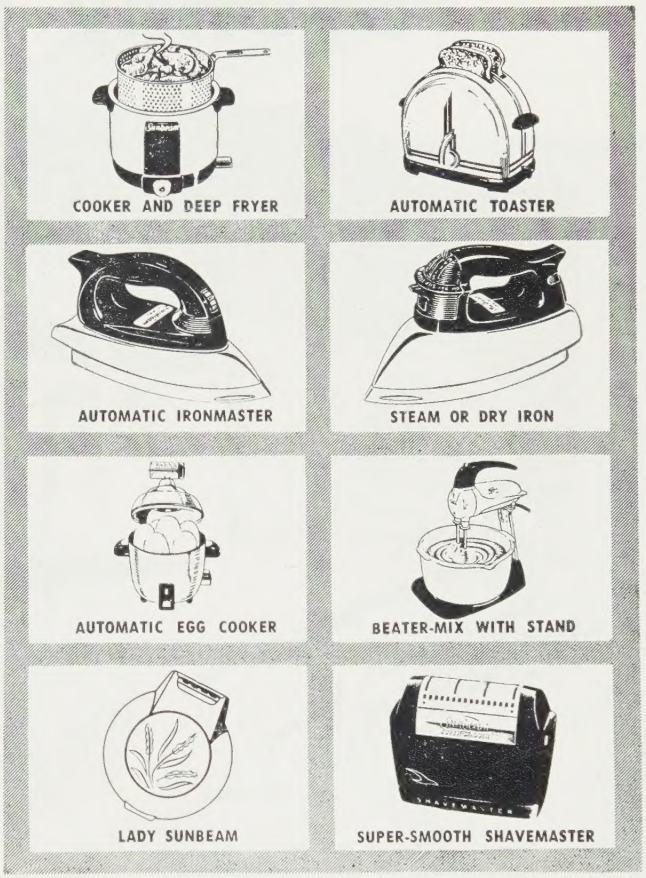

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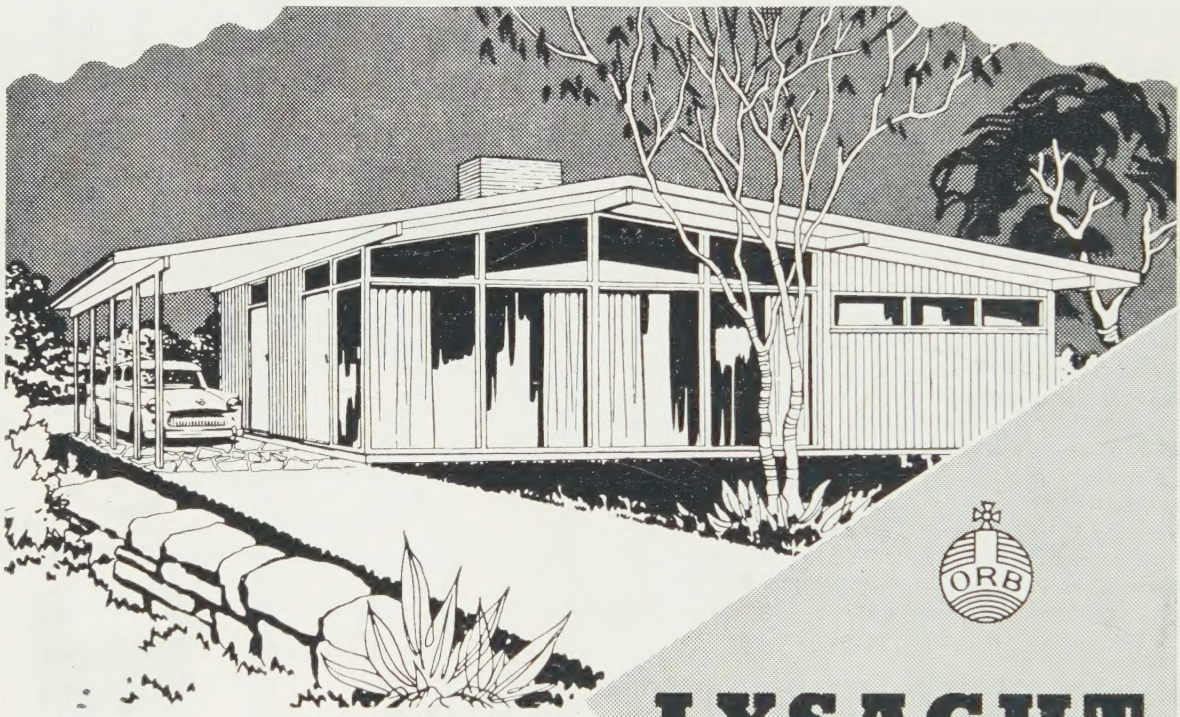

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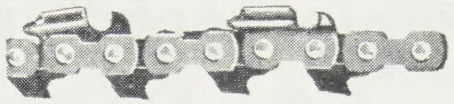

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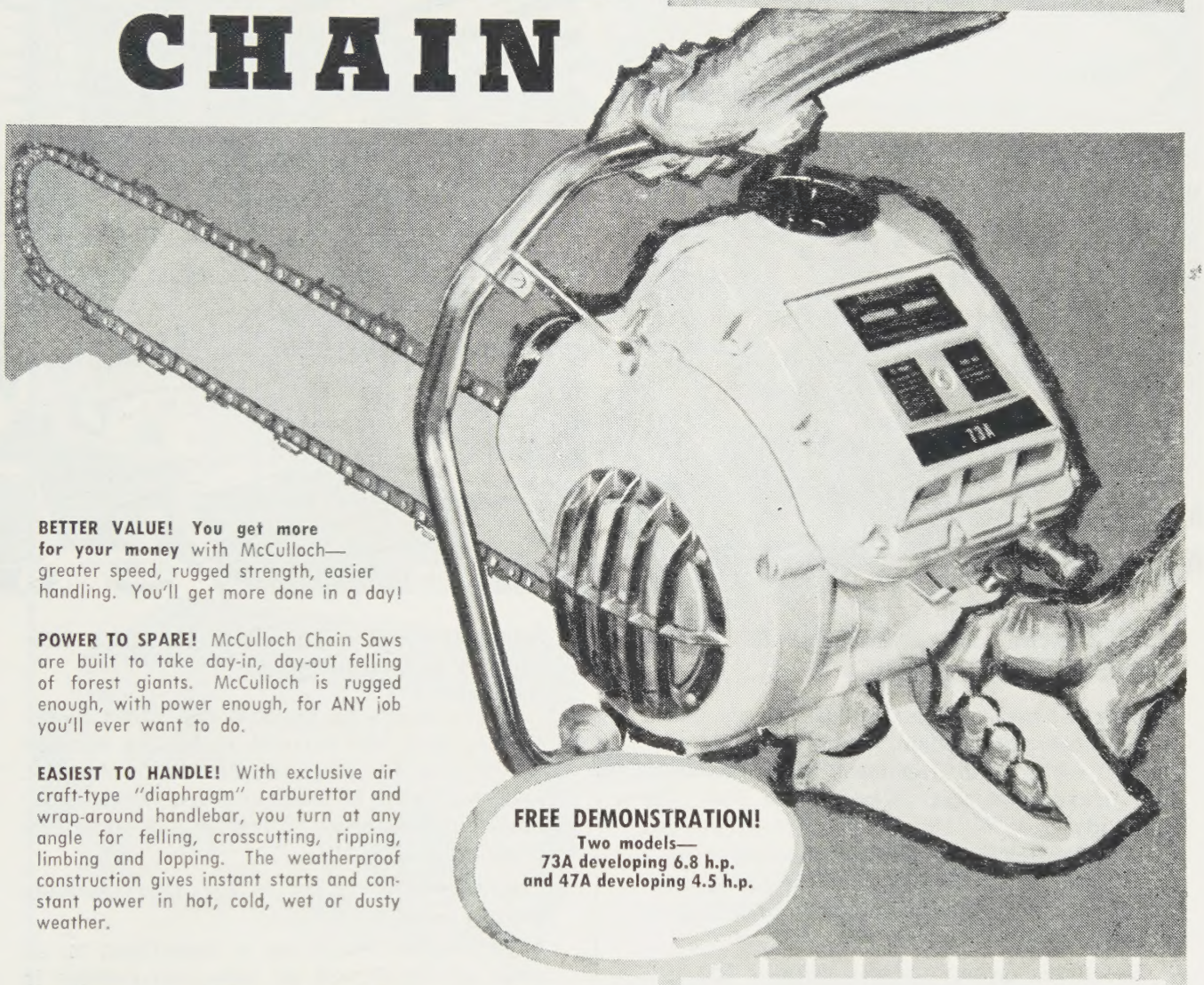

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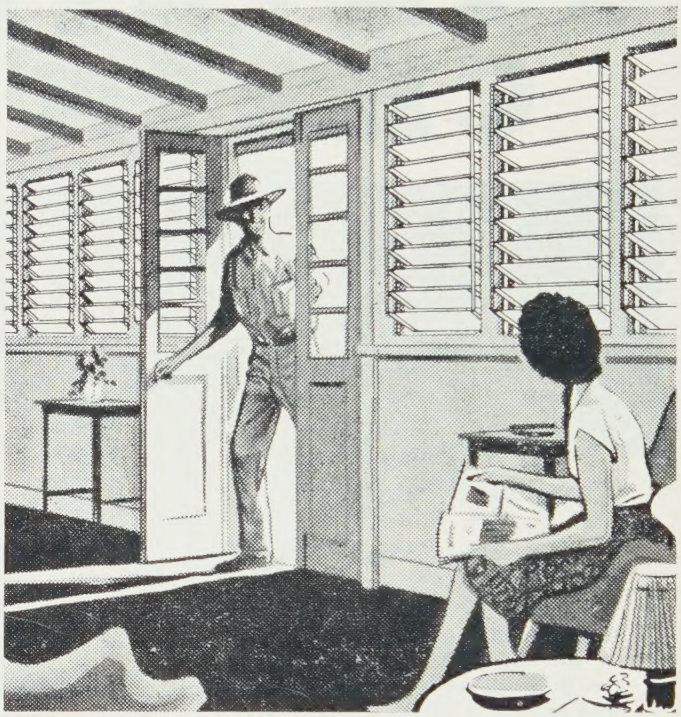

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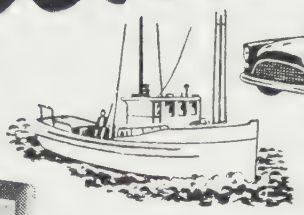

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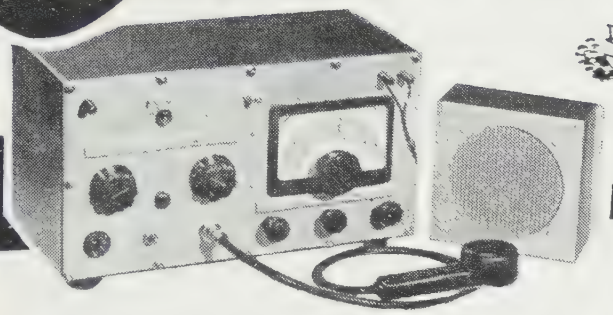

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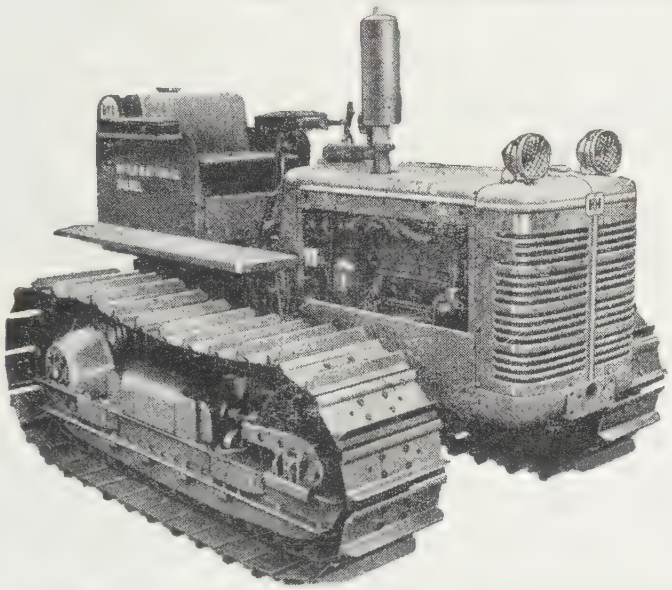

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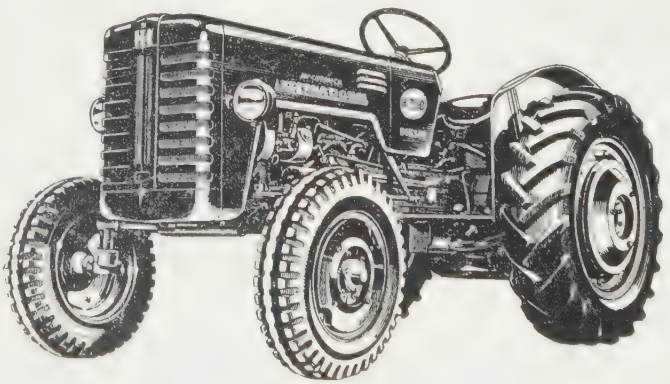

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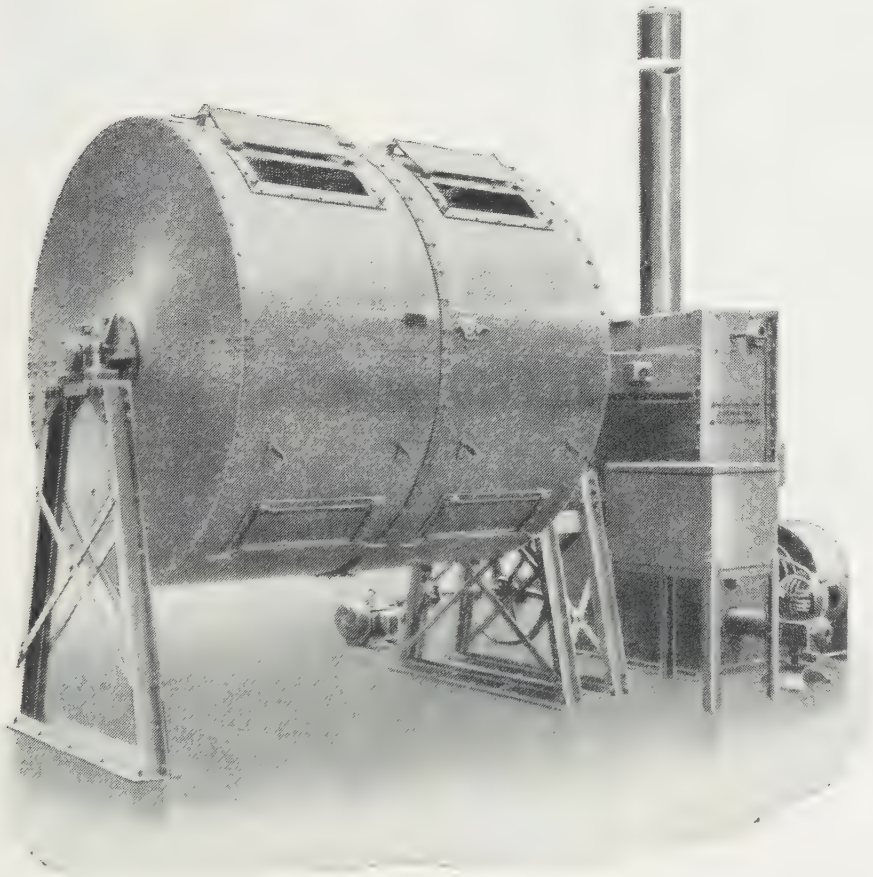

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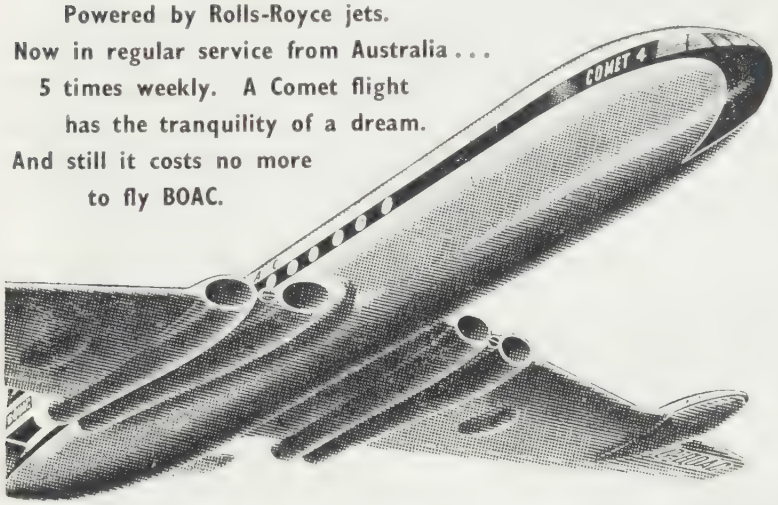

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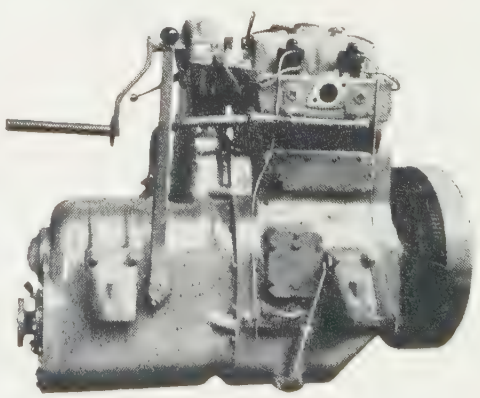

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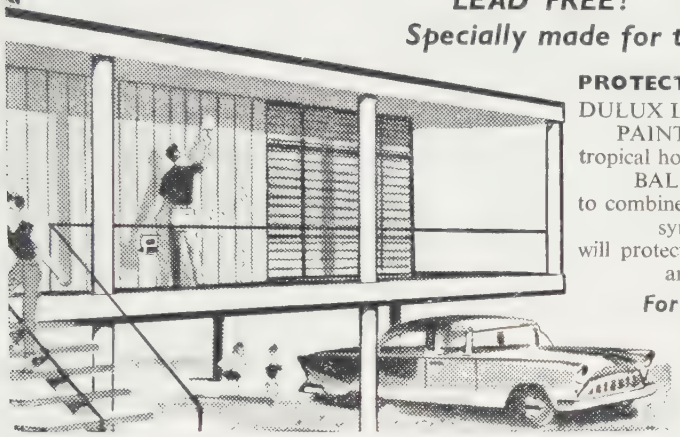

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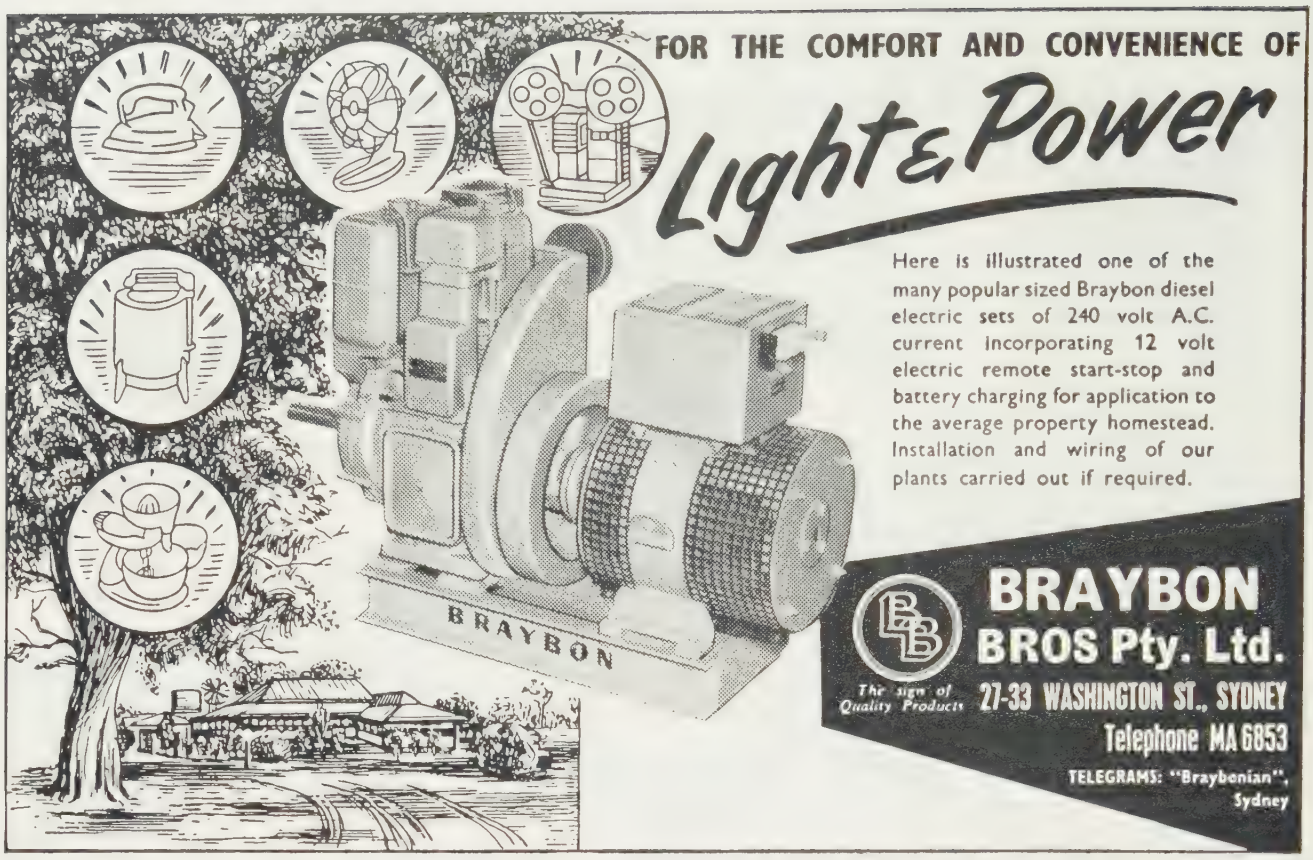

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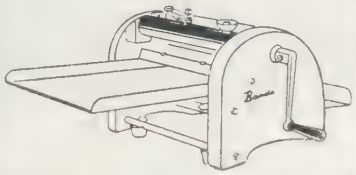

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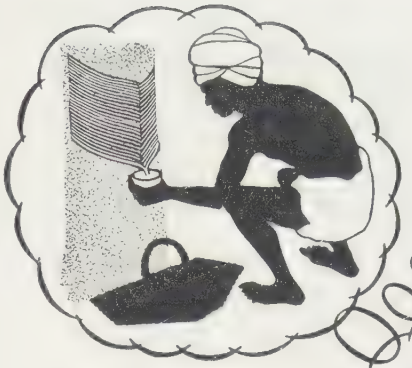

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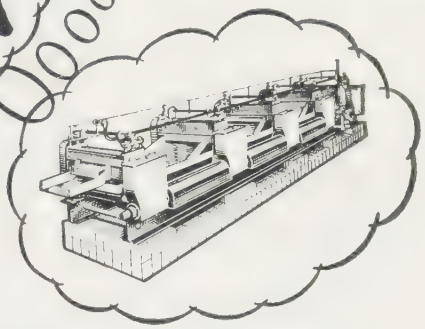

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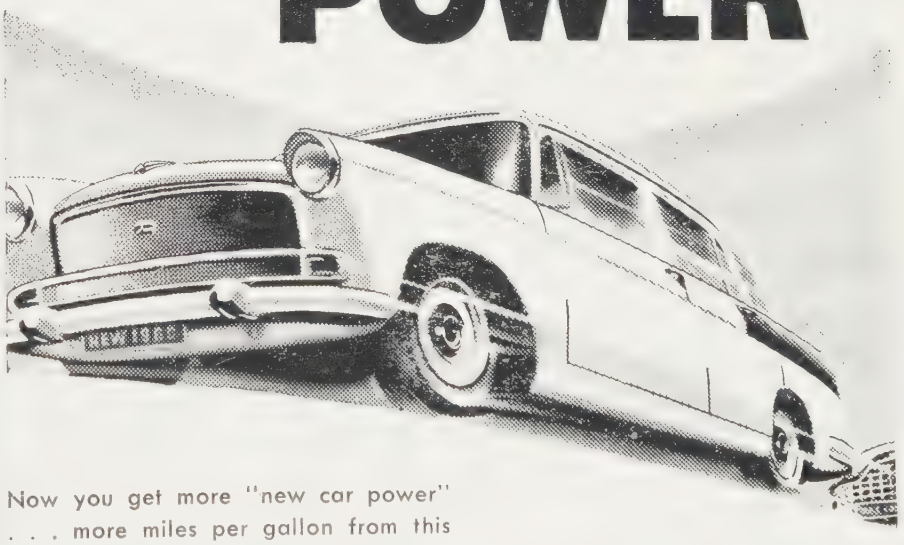

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Housing Estate For Low-Income Workers Opened In Suva

His Excellency the Governor of Fiji, Sir Kenneth Maddocks, K.C.M.G., presents one of the Fijian tenants, Jone Cagi Salele, and his wife with the key of their new home. In the background are other tenants waiting to receive their keys.

Last April the first sod was turned in a pilot project to build 28 houses for low-income workers on a housing estate on the outskirts of Suva, Fiji. Seven months later—on November 27—the Governor of Fiji presented 28 selected families with the keys to their new homes.

By H. H. MADAMS*

JUST over twelve months of intensive planning and activity were brought to fruition on November 27 last, when His Excellency Sir Kenneth Maddocks, K.C.M.G., Governor of Fiji, declared open the Fiji Housing Authority's first housing estate for low-income workers, at Raiwaqa, Suva.

"There can be few more worthwhile undertakings", declared Sir Kenneth, "than the provision of good modern housing for people who cannot afford to build homes of their own. This estate, the first of its kind in Fiji, is an important milestone in the social development of the Colony".

"The first members of the new community", went on Sir Kenneth, in his address to tenants, "are to be part of an inter-racial social experiment of a type unique in Fiji. You will live together in what will be a growing society of all races. Your move to this estate and to new conditions will not be without its challenge and its difficulties".

The 28 families who will be the Authority's first tenants received the keys of their homes from Sir Kenneth.

Only seven months previously the Colonial Secretary, Mr. P. D. Macdonald, had performed the ceremony of turning the first sod. Despite bad weather, building activity proceeded without interruption. The first 100 houses are expected to be nearing completion by the end of 1960.

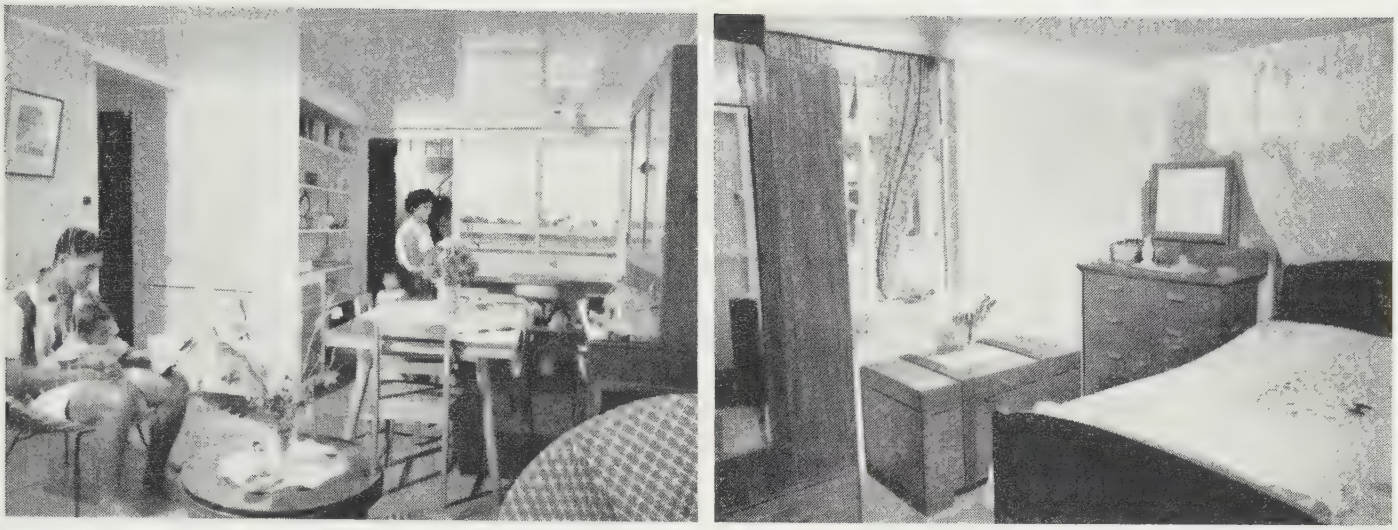
The 43 acres of land on which the Raiwaqa Estate is being developed is a gift by the Fiji Government to the Housing Authority. The benefits of this gift will be passed on to householders when they begin the purchase of their homes. They will receive 99-year leases of their plots at a peppercorn rental.

Pilot Project Of 28 Cottages

The Authority began development at Raiwaqa with a pilot project of 28 de-

* Executive Secretary, Fiji Housing Authority.

The photograph below appeared in the Quarterly Bulletin for April of last year. That on the right was taken in November, from roughly the same spot. Opposite is a general view of the housing estate, taken on the day of the opening.



Interior views of one of the houses, showing combined kitchen and living room and the larger bedroom. All houses are exposed to the prevailing breeze, and their high louvre windows keep them pleasantly cool.

tached cottages. These are of the bungalow type, of concrete block construction, with timber partitions and corrugated iron roofs. An experiment is being conducted in one of them in the use of sawdust concrete as a flooring material.

Each house consists of a living room measuring 116 sq. ft., two bedrooms measuring 94 and 65 sq. ft. respectively, a kitchen, shower and water closet. The houses are compact, and there are no out-buildings. Food storage accommodation is provided by built-in shelves and a flyproof food safe. Sanitation is by the water carriage system—a communal septic tank providing for up to 80 houses. The design of the buildings allows for extension if the family outgrows its accommodation.

The Housing Ordinance empowers local authorities in Fiji to approve housing schemes designed by the Housing Authority, even though such schemes may not comply fully with health, building and town planning laws in force in their district. There has always been a tacit understanding in this respect that the Housing Authority will exercise a strong sense of responsibility in any requests for relaxations which it makes to local authorities. In fact, compensating factors are always considered for any relaxations of regulations which are requested. The object of such relaxations, of course, is to provide more houses and to reduce construction costs.

The three most significant relaxations which have been embodied in the Raiwaqa scheme, and approved by the Suva City Council, are:

(a) the reduction of the size of building lots;

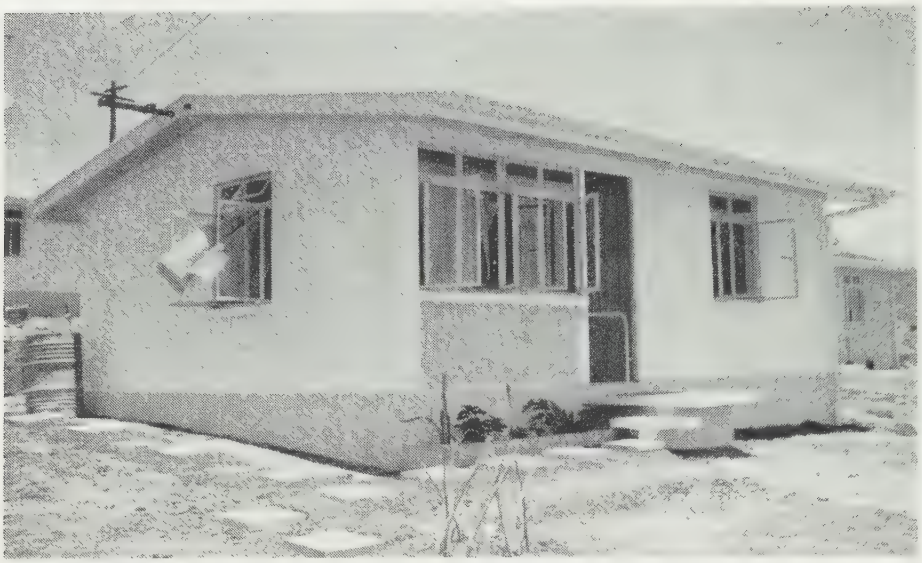
(b) the reduction of ceiling heights; and

(c) the provision of footpath access only to many houses.

Under the present law in Suva, a plot of land on which a dwelling is to be erected may not be less than 6,600 sq. ft. in area. This regulation is generally considered, under modern conditions, to be wasteful of building land. In the Raiwaqa scheme the average size of plots has been reduced to 3,480 sq. ft. In order to avoid any appearance of congestion, and to provide more air space around buildings, the houses on these smaller lots have been "staggered". The concensus of opinion is that a most attractive layout has resulted.

The ceiling height of houses in the pilot project has been reduced from 8 ft. to 7ft. 3 in. This has been compensated for by the provision of louvre windows as nearly as practicable at ceiling height. All houses are exposed to the prevailing breeze and, since the bedroom partition is 6 ft. only in height, the buildings are pleasantly cool.

The footpath access provided round and through the Estate has been incorporated in the layout in order to make the maximum use of the available land and to cut down the expense of conventional road construction. Footpaths have been laid in concrete, 3 ft. wide, with 3 ft. 6 in. of grass verge on either side. Although the use of these access-ways by any type of vehicle is discouraged, they could in fact be so used in a case of emergency. No house is more than 300 ft. from the made-up road.



One of the cottages. Simple and attractive in design, they are built of concrete blocks, with timber partitions.

Two-Storey Duplex House Also Built

The pilot project type of house is sufficient to accommodate a maximum of six persons. A larger type, sufficient for nine persons, is also being constructed at Raiwaqa. This is the duplex, or semi-detached house, 14 of which have been built as the Stage 2 development of the Estate. These are two-storeyed houses, built in pairs.

They were at first viewed with some misgivings by Fijians and local Indians, who are accustomed to living at ground level. But as the advantage of the greater compactness provided by an additional storey became evident all new tenants are likely to appreciate this type of home. When it was made clear to prospective tenants that the party-wall was to be 6-in. concrete block and not merely a timber partition, another source of apprehension was dispersed.

The duplex house (573 sq. ft.) consists of a large bed/living room, dining room and kitchen on the ground floor, and two bedrooms and a shower, with linen cupboard on the first floor. The water closet and laundry are contained in an extension of the main building. Access to the latter is under cover.

Under the provisions of the Housing Ordinance which brought the Housing Authority into existence, the latter body is bound to run its affairs economically —in other words, no form of subsidised housing may be attempted. This being so, it was recognized at an early stage that by beginning its activities in an attempt to house the lowest paid worker —usually the one with the larger family —at a time when the Authority was struggling with its own teething problems, would throw an excessive burden on the new organization. For this reason the Authority decided that its first houses would be built for the upper bracket of the low-income group, i.e. the £6 to £12-a-week worker. A scheme would be introduced to enable occupants to purchase their houses over an extended period.

327 Applications Received

Applications were called in this group, from workers in the City of Suva, and 327 applications were received. Of these, 61 from Fijians, 71 from Indians, and 23 from part-Europeans and others were found to be acceptable. These 155 applications were arranged in priority order The remaining 172 applicants were wait-listed.

Priorities were determined firstly on a points basis. The points system takes into account such matters as the state of an applicant's present living accommodation, e.g. whether it has a main water supply, the nature of sanitary arrangements, the degree of overcrowding in his family and in the whole house if he shares a dwelling with other families.

In determining priority, continuity of employment is also considered, and, in a personal interview with the Executive Secretary, the applicant's health, character and his ability to meet rent and loan repayments, are assessed. The size of family is another important factor. The Authority has been meticulous in avoiding overcrowding in the new houses.

Racial Distribution Problem

The first 28 tenants on the priority list consisted of 11 Fijians, 10 Indians, and 7 part-Europeans and others. The problem then to be faced was in the racial distribution of occupiers among the pilot project houses. Should this be left entirely to chance, a ballot deciding the occupant of each house; or should each racial group be allocated a separate area of the Estate? It was felt that both these extremes must be avoided if the Raiwaqa Estate were to have real value in developing an organized inter-racial community.

A sub-committee representing the European, Fijian and Indian points of view was appointed. There were all manner of special problems to be considered; the penetrating odour of Indian curry, which to non-Indians may be offensive; the blare of radio music, the requests from the poorer tenants to be allowed to keep pigs, fowls and goats— these were only some of them. They could not all be solved: to some extent tenants must be relied upon to show civic-mindedness. This, after all, was what Raiwaqa was trying to foster.

The final pattern, although arrived at after long deliberation, was simple enough, and met with the approval of the Authority and the tenants alike. The layout of the houses was approximately in the form of a square. Through this the seven part-European tenants were distributed in the form of a rough cross. Twenty-one Fijian and Indian families were then mixed evenly in the four corners. This arrangement had the advantage of avoiding "racial pocketing" but at the same time ensuring that each tenant had a neighbour of the same race within a reasonable distance.

Final Allocation By Ballot

The final allocation of houses was decided by ballot. The "racial pattern" determined by the Authority was indicated on a plan of the Estate. Houses were coloured red, blue and green according to the race to which they had been allotted. From this point onwards the Authority ceased to speak of Fijians, Indians and part-Europeans. Three separate ballots were held for "red", "blue" and "green" houses, each tenant thus drawing the number of his house within the pre-determined pattern.

The ceremony of drawing the ballot, which was conducted at the Authority's office in the presence of the Chairman and Members of the Authority, was accompanied by a touching show of emotion on the part of prospective householders.

Two-Year Probationary Period For Tenants

Although the Housing Authority has taken care to select tenants likely to make good citizens, willing to contribute to the communal life of the Estate, under the Home Purchase Scheme each tenant is required to fulfil a probationary period of two years. During this period, occupiers are monthly tenants, liable to give or receive a month's notice.

The monthly rent of the pilot project houses is assessed on the cost of the house, repaid over 20 years at 5%.

(Continued on page 33)

The Chairman of the twentieth session, Dean Knowles A. Ryerson, Senior Commissioner for the United States of America, addressing the opening meeting on October 13.

Commission Reviews Work Programme

At its twentieth session held in Noumea from October 13-23, the South Pacific Commission reviewed progress made in its work for Pacific island peoples, and finalized plans for its continuance in 1960.

THE twentieth session of the South Pacific Commission was held at Commission headquarters in Nouméa from October 13-23. It was attended by representatives of the six member nations, Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America. The Chairman was Dean Knowles A. Ryerson, Senior Commissioner for the United States.

The meeting studied progress made during the past year by the Commission in its three main fields of work—economic development, health, and social development—and reviewed its work programme for 1960. Decisions taken are summarized briefly below.

More Reading Matter For The Islands

As its latest contribution towards filling the acute need that exists throughout the Pacific islands for reading material, the Commission is setting up a literature production training centre at Honiara in the British Solomon Islands, with the active co-operative of the Administration.

The Centre will provide training for thirty-six islanders from territories throughout the Pacific, in the preparation and production of many kinds of printed materials needed in the islands such as school books, news sheets, forms, leaflets for extension workers and so on. In addition the Centre will, by helping to provide trained staff and by investigating practical problems, assist territories towards self-sufficiency in the provision of printed matter designed specially for their own conditions.

There will be three one-year courses. The first, which will open in February 1960, will be attended by twelve trainees from six Pacific territories—two each from Fiji, Papua and New Guinea, Cook Islands, United States Trust Territory of the Pacific Islands, Western Samoa and the British Solomon Islands.

The United Nations Educational, Scientific and Cultural Organisation is actively collaborating in the scheme, and is providing substantial financial assistance. The Centre is being organised by the Commission's Literature Bureau, which was set up in 1952 to stimulate the supply of suitable reading matter for Pacific islands people.

Campaign Against Coconut Pest

Each year the rhinoceros beetle causes losses to the Pacific copra industry of not less than £750,000 (estimated loss in one territory alone — Western Samoa — is £300,000 per year).

In recent years Commission entomologists have been searching for controls for this pest in South-east Asia and tropical Africa, where apparently natural enemies keep it in check.

One entomologist, Dr. C. P. Hoyt, who is searching for pests and predators of the beetle in Nigeria, will continue his investigations in Africa during 1960. With the aid of two Rockefeller Foundation grants the Commission's insect pathologist, Dr. Paul Surany, has spent four years in Kenya studying diseases of the beetle, and has found two that are promising for its biological control.

Dr. Surany has prepared a report on his work to date that will be published shortly by the Commission, under the title *Diseases and Biological Control of Rhinoceros Beetles.*

The Commission will seek financial and technical assistance for its rhinoceros beetle control project from appropriate United Nations bodies, industries concerned with the copra trade, and possibly the research organizations of its member governments.

The Commission approved a balanced programme for future work in this project, covering various methods of control such as field hygiene, biological control

This group photograph was taken after the opening ceremony on October 13. Left to right, front row: Mr. J. A. van Beuge, Netherlands; Mr. H. Nettre, France; Sir Kenneth Maddocks, U.K.; Mr. T. R. Smith (Secretary-General); M. Péchoux, who as Governor of New Caledonia and Dependencies, at the formal opening welcomed participants to the Colony; Dean Knowles A. Ryerson, U.S.A.; Mr. D. McCarthy, Australia; Mr. G. Nevill, N.Z.; Dr. R. Seddon (Executive Officer for Social Development); Mr. J. Bach, France. Back row: Mr. E. D. Mackinnon, Australia; Dr. A. S. Osborne, U.S.A.; Mr. D. Ernst, U.S.A.; Mr. R. B. Hodgson, Australia; Dr. T. C. Lonie (Acting Executive Officer for Health); Dr. A. Spoehr, U.S.A.; Miss Edna H. Barr, U.S.A.; Mr. J. S. Rennie, U.K. (partly obscured); Mr. A. O. Dare, N.Z. (partly obscured); Sir John Gutch, U.K.; Mr. K. E. Breslau, Netherlands; Dr. A. Loosjes, Netherlands; Dr. A. H. J. Kroon (Executive Officer for Economic Development); Dr. Th. P. Bergsma, Netherlands; Mr. C. T. Moodie, Australia; Mr. T. R. Cowell, U.K.; Mr. C. G. R. McKay, N.Z.; Mr. C. H. Cox, Australia.

by predators and parasites, and the use of insecticides and attractants.

Two SPC Meetings

The Commission approved final arrangements for two meetings to be held under its auspices during November 1959, an education seminar for the Pacific, to be held in Brisbane from November 16-27, and a study group on filariasis, to be held at Commission headquarters from November 12-24.*

SPC Boat-Building Course

The Commission will organize a regional training course in boat-building, repairs, and maintenance to commence in 1960 in Auki, Malaita, in the British Solomon Islands. A manual on boat-building now being prepared will be used as a text-book for the Course.

Plant Collection And Introduction

In the past two years more than 250 species and varieties of economic plants have been distributed to territories through the Commission's plant introduction service. The plant introduction officer paid special attention to coffee, cocoa, root and green vegetables, breadfruit, pepper, bamboo, other possible cash crops, and forage and pasture plants. He has almost completed a regional survey of economic plants of the Pacific, and is engaged on a special study of the breadfruit.

The Commission approved a further grant for 1960 of £1,000 sterling to the plant introduction station at Naduruloulou in Fiji, which collaborates closely in this work.

Health Education In The Pacific

Main emphasis of the Commission's health education programme is on local training. A regional course in health education is proposed for 1962, with the possible assistance of appropriate United Nations bodies.

The Commission reviewed the work of the health education officer, Miss L. J. Martin, who took up her post last May. In June she left for the New Hebrides where at the invitation of the authorities she assisted in running a short refresher course for medical dressers. Miss Martin will assist other territories as requested by organizing and taking part in short health education training courses.

Coconut Industry

At their meeting last June, the economic development members of the Commission's expert body, the Research Council, gave special study to the problems of the coconut industry in the Pacific.

The Commission approved a grant of £2,000 to continue in 1960 its assistance to the French coconut experimental station now being set up on Rangiroa Atoll in the Tuamotu Group.

The possibilities will be explored of holding a meeting in 1962 of technical workers in the region concerned with coconut improvement.

Women's Interests Project

Last June the Commission's women's interests officer, Miss Marjorie Stewart, arrived at Aitutaki in the Cook Islands. She will remain there for two years, with short visits to other territories. Her main task is to work with village and community leaders in developing women's activities in a way that will take account of their home and community needs and opportunities.

A leading women's organization in the United States, United Church Women, is taking a keen interest in the project, and has made a grant of $30,000 to assist the Commission in this new field of activity.

Travelling Library For The Solomons

The Commission's Literature Bureau was set up in 1952. Since then a wide variety of specially-written books and pamphlets have reached people in the islands through its efforts, which are mainly devoted to encouraging and assisting publishers to serve this special field.

(Continued on page 36)

Change Of Title

At its twentieth session the Commission decided to change the title of the SPC Quarterly Bulletin *to* South Pacific Bulletin. *The change is effective as from this issue.*

* A report on each meeting appears elsewhere in this issue.—Editor.

Big-game angler fighting a marlin from a jury-rigged fishing chair which the Fijian boatman is swinging. Note kidney rod harness which takes much of the strain off the arms.

Right: Silver marlin caught off Bega, in Fiji, by Mr. Art Ewing (right), an American big-game angler. The fish was 11 feet long and weighed 374 pounds. At left is Mr. Harry Terry, Fiji representative of the International Game Fishing Association and well-known big-game fishing guide.

Big-Game Fishing Would Bring World Anglers To Pacific

Those interested in promoting tourism in the Pacific could well investigate the possibilities of developing big-game fishing as a major attraction for visitors. The author of this article considers that blue-water anglers the world over would flock to the Pacific if the sport were properly established here in proved waters. He reveals that a highly promising beginning has already been made in Fiji.

By ROB WRIGHT*

ABOUT the year 1935 Michael Lerner, one of the foremost big-game anglers in the world and later President of the International Game Fish Association, took passage on a ship to Nova Scotia, from whence news had come of giant tuna. He landed at Yarmouth and made his way to a town where broadbill swordfish and blue-fin tuna were being harpooned in quantity by commercial fishermen. Up to this time no blue-fin had ever been caught on rod and reel, and Mike Lerner wanted to be the first to try it.

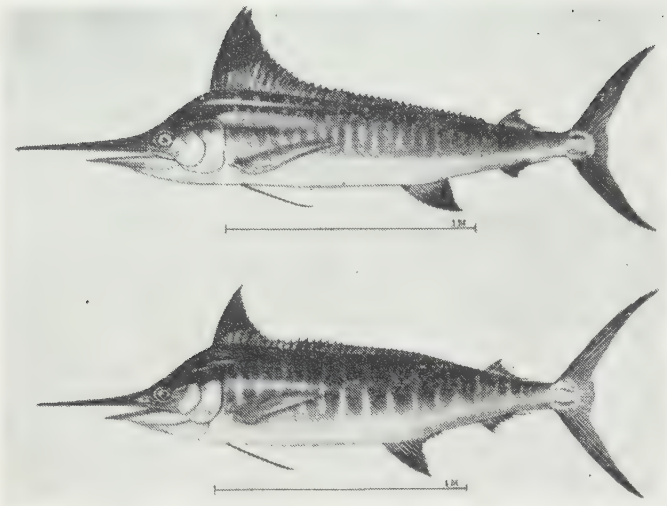
On arrival he found that the fish had been there and were expected back, but that there were very few around at the time. He fished for several days without success, and then decided to give up and return to the United States. On his way back to the ship he struck up a conversation with a man from Wedgeport, another Nova Scotian township. What he learned from the stranger induced him to cancel his passage and leave immediately to try his luck at Wedgeport.

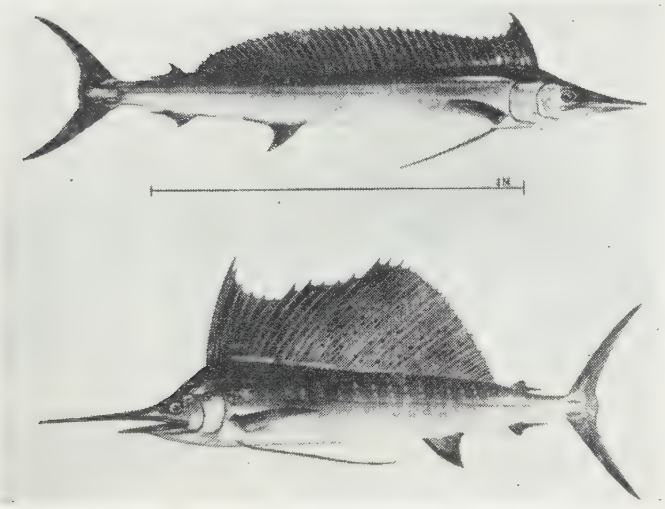
The fish he took there on this occasion, and on subsequent visits, immediately established Wedgeport as a game-fishing centre. Revenue and fees from the big-game anglers—both men and women—who flocked to the area enabled the town to blossom out with new shops and hotels; fishing dories gave way to modern sport-fishing launches, and the town enjoyed a prosperity which continues to this day.

This little story illustrates what can happen when a new and good big-game-fish area is located. Success and prosperity invariably follow, for the big-game angler will go to the ends of the earth to match his skill. Kona in Hawaii, Acapulco in Mexico, Tocopilla in Peru, Russell in New Zealand, and Bermagui in Australia are all examples of what can happen to towns associated with the taking of big-game fish.

The drive by member countries of the Pacific Area Travel Association to attract tourists to the Pacific, and the resolutions and recommendations for the promotion of tourism as an industry discussed at

* Mr. Wright, who is the official photographer attached to the Public Relations Office in Fiji, also conducts a popular Saturday feature for amateur fishermen in the *Fiji Times* entitled HOOK, LINE AND SINKER.





Above left: Striped marlin (upper); Indo-Pacific blue marlin (lower).

Above right: Black marlin (upper); broadbill (lower).

Left: Shortnosed spearfish (upper); sailfish (lower).

the fourth South Pacific Conference in Rabaul, would seem to indicate that now is the time for Pacific territories to look into the money-making sport of big-game fishing.

The first and obvious thing to take into account is whether big-game fish exist in these areas. It is generally conceded that billfish such as marlin and sailfish *do* occur in the waters of most South Pacific territories. Tahiti and Fiji have been fished sporadically for a number of years by occasional anglers, while longlining has revealed marlin and sailfish in Tongan waters and around the New Hebrides.

Six Spearfishes In Pacific

A Fisheries Bulletin of the United States Fish and Wildlife Service states that six species of spearfishes are recognized in the Pacific. These are the swordfish or broadbill (*Xiphias gladious*), shortnose spearfish (*Tetrapturus angustirostris*), sailfish (*Istiophorus orientalis*), black marlin (*Istiompax marlina*), striped marlin (*Maikara audax*), and Pacific blue marlin (*Maikara ampla*).

All six species are shown to be fishes of wide distribution in the Pacific, but with different centres of abundance. The swordfish and striped marlin prefer the more temperate waters, the Pacific blue marlin the equatorial region, and the black marlin the coastal areas off Asia, America and Australia.

Maximum known weights of the Pacific forms (in pounds) are as follows: Swordfish—1061; shortnose spearfish—114; sailfish—132; black marlin—1560; striped marlin—483; and Pacific blue marlin—1450. (These weights may now have been exceeded.)

The separation and naming of the species of the spearfishes has been a problem of particular difficulty because the original descriptions of most of the species are so poor, and some of the species are so similar and variable, that it is impossible to identify them immediately from the original descriptions. It has been necessary to start with identifications made by fishermen, most of whom are experienced longline fishermen and have seen many marlins.

The key to Hawaiian fishes by Brock which is based on observations of the marlins sold in the Hawaiian market has also been of benefit. Fishermen of Hawaii recognize six species to which they have given the English names of black marlin, silver marlin, striped marlin, Indian spearfish, sailfish, and broadbill swordfish.

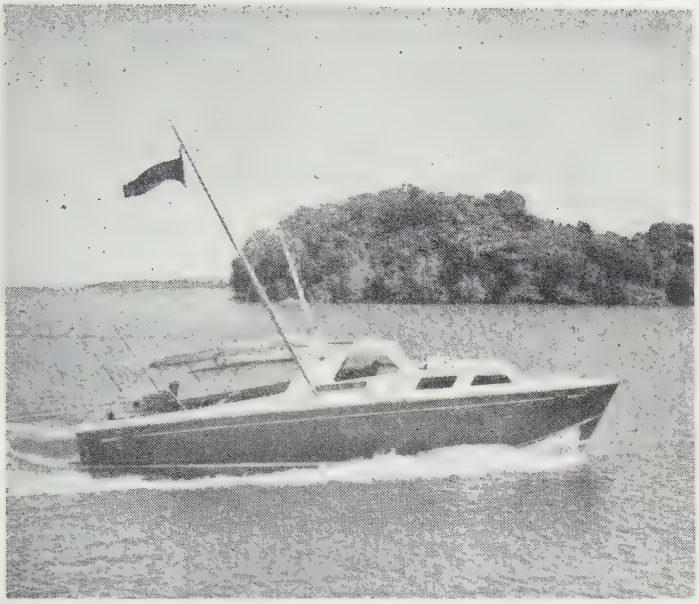
Craft For Big-Game Fishing

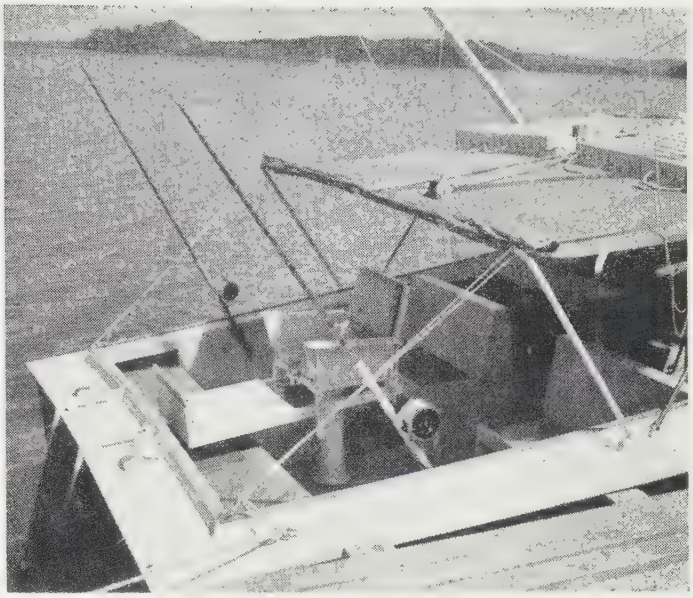
Having established that big-game fish are to be caught in a certain locality, the next step is to make available craft from which sport-fishing can be conducted.

These fall into two categories: jury-rigged motor-boats of anything up to thirty feet, powered with inboard or outboard engines and in which a fishing chair has been fitted, and a true charter-fishing cruiser of off-shore design ranging from thirty to forty-five feet in overall length, equipped with twin gasoline or diesel motors, outriggers, radio, shelter cabins and other modern amenities.

The first type can be used only in sheltered waters, as it is essentially a pleasure craft or work boat and not intended for deep-sea work. Most island territories have numerous launches of this type, and with careful planning they can be converted to game-fishing boats of limited use. Many good fish have been caught from these conversions, but they do limit the scope of big-game angling.

The second type are able, rugged little ships capable of fishing for spearfish in turbulent waters, and not any motor-boat will stand up to this tough service. Investment in a charter-fishing boat is likely to be heavy, and outlay will run from £1000 to £5000. Annual maintenance costs are also high for this type of craft. Engines, radio, fishing tackle, etc., must be kept in good condition, and the boat must be hauled out frequently for painting and refitting.





Above: This modern big-game fishing launch "Sere-Ni-Wai" has twin diesel engines capable of giving her a top speed of 20 knots, and cruising speed of 12 knots. Outriggers are laminated hollow spars, well-braced and reinforced. The cruiser has sleeping accommodation for four, galley, roomy cockpit, and is fitted with depth-finder, ship-to-shore radio, compass, searchlight, etc. She is skippered and owned by Mr. Alf Lee of Suva, with his son Dallas as mate and engineer. Marlin flag is flying from an outrigger. "Sere-Ni-Wai" is also adaptable for general tourist charter cruises. Right: Cockpit arrangements. Adjustable fishing chair is sturdily mounted; includes backrest and footrest, both adjustable for height and length. Rod-gimbal for base of rod to fit in is mounted on edge of seat. Rod guides are fitted to inside edge of coaming and hold rods in this position while trolling is in progress. Big-game rods have roller-bridged guides and Penn reels. Temporary shelter of canvas can be swung back out of way when a fish is being fought.

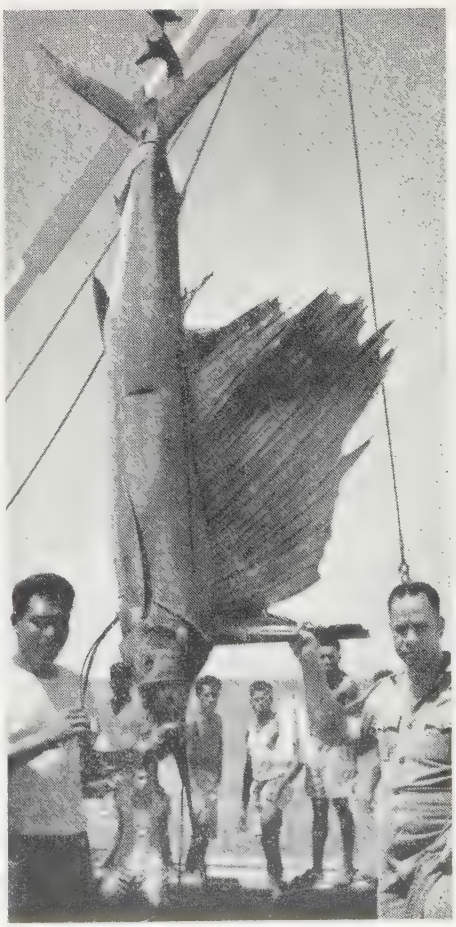
Charter boats are usually handled by a skipper and a mate. Depending on the laws of the country, these men may be required to have tickets for a limited tonnage. They are as equally responsible for the safety of their passengers as is the captain of an ocean liner.

A charter-boat captain should be an experienced fisherman, with a sound knowledge of the area in which he proposes to fish and of how to rig tackle, baits, etc. A good boat-handler can anticipate action during the fight with game fish and by manoeuvring his craft accordingly may add a 50% boost to the angler's chances of boating the fish.

Tackle For Big-Game Fishing

Big-game fishing tackle is expensive all the way through. Rods should be of a good quality split cane or glass of reputable make, in order to withstand the tremendous strain put on them when fighting game fish. Fishing reels must also be large enough and of good design to take constant hard usage and ample line.

The line itself must conform to standards laid down by the International Game Fish Association. Linen is still a favourite line with many big-game anglers, but with the introduction of



Left: Silver marlin weighing 572 pounds taken by Mr. Louis Nohl of the United States in the Yasawa Group to the north of Viti Levu. Right: A sailfish taken trolling from an inter-island vessel. The lure used was a "viavia" (appearing below hand of man on right) made from a portion of lily stem and affixed to a lead weight.

Above: Preparing a mullet for trolling bait. Right: A large Pacific sailfish boated after a fight. The fish was first noticed between two and three hundred yards away "greyhounding" after the bait, which it took. The conventional "drop-back" was given and the fish hooked.

synthetic materials such as nylon, dacron and terylene, many fishermen have gone over to these.

Lines And Reels

Lines are based on different classes of tackle in order that light-tackle achievements may receive the recognition they merit. A "thread" based on linen line is generally conceded to have a breaking strain of three pounds, and the tackle (or line) size records are divided into thread classes as follows: 3-thread (9 lbs.); 6-thread (18 lbs.); 9-thread (27 lbs.); 15-thread (45 lbs.); 24-thread (72 lbs.); 39-thread (117 lbs.); 54-thread (162 lbs.).

Catches made on line sizes between the approved standards will be made under the next stronger line size. For example, a catch on a 12-thread qualifies in the 15-thread class, etc.

By International Game Fish rules, the leader and double line on all weights of tackle up to and including 15-thread should be limited to 15 feet of double line and 15 feet of leader or trace. For heavier tackle, the line should not be doubled at the trace end for more than thirty feet, and the trace should not exceed thirty feet.

There are three well-known American reels and a British (Hardy) reel which have been popular with big-game anglers for many years.

Topping the list is the "Fin-or", which is the most costly reel made, and a semi-custom built job. The series includes a 4/0, 6/0, 7½/0, 9/0, and 12/0. One of the outstanding features of the "Fin-or", and where it differs from other reels, is its drag system. It works by means of a lever. If the latter is pulled back the reel is in free spool. On a semi-circular track are holes into which a spring stop fits. By placing the stop in any particular hole, the drag will remain constant for that setting. In other words, the correct amount of tension may always be found when desired without resorting to a star drag wheel as on other reels. A 12/0 "standard" costs about £230, and a 12/0 "special", which holds 750 yards of 39-thread line, sells at about £250.

One of the most popular reels made is the "Penn Senator" series, which runs from 1/0 to 16/0. The latter holds 750 yards of 54-thread. The star drag system on the "Senator" employs a type of brake-band material similar to that on automobile brakes, and is extremely durable. The largest reel made by this Company—the 16/0—sells for about £50, which is quite a nominal price for a tested precision product.

Ocean City also makes a series of big-game reels from 3/0 to 16/0 in size. These are top quality, and are capable of handling assignments of any size.

Good average tackle for big-game fish would be a 24-thread line with a 16-ounce rod and a 12/0 reel.

Baits And Lures

Having assembled tackle, the boat captain next thinks about baits and lures for game fish. At one time it was assumed that marlin or sailfish would not take anything but fresh fish bait, but more recent developments have proved they are also attracted to lures. In Fiji, for instance, they have been taken on spinners, heavy feather lures, and on heavy plastic plugs. At Kona, in Hawaii, the Tada plastic lure—a Japanese development—has been used with great success.

Sea mullet or barracuda about 12-16 inches long have been found to be an effective fresh bait, while small tuna and bonito are equally good. Most of the Pacific islands do not have the popular kahawai which is used in New Zealand with success.

Preparing The Bait

To prepare the bait, the stomach or back of the fish is slit open and a section of the backbone from gill-plates to tail is removed. The hooks are inserted so that the barbs protrude from the belly.

(Continued on page 62)

Participants, observers and Commission staff of the Seminar photographed on the main entrance steps of the University of Queensland, St. Lucia, Brisbane.

Education In The South Pacific

Thirty-one educationists from fourteen Pacific territories and the six metropolitan countries of the South Pacific Commission attended a highly-successful regional education seminar held at Brisbane last November.

THE South Pacific Commission Regional Education Seminar for the South Pacific met at the University of Queensland, Brisbane, from November 16-27.

Senior education officers were present from fourteen Pacific territories, each of the Commission's six participating governments was represented by a leading educationalist from the metropolitan country, and official observers attended on behalf of five representative mission organisations. In addition a UNESCO consultant in the field of language teaching, and Commission officers, took part in the discussions.

As its Chairman, the Seminar appointed Major G. F. Bovey, M.B.E., Chief Education Officer in the British Solomon Islands Protectorate, and as its Deputy Chairman Dr. Robert E. Gibson, Director of Education, Trust Territory of the Pacific Islands, while the administrative direction of the Seminar was in the hands of Dr. Richard Seddon, the Commission's Executive Officer for Social Development.

Formal Opening On November 16

At a formal opening ceremony on the morning of November 16 members were joined by representatives of the Commission's participating governments, guests from the University of Queensland—which provided facilities and assistance for the Seminar—from Emmanuel College, which provided residential accommodation, and from the Brisbane community.

The Deputy-Chancellor of the University expressed pleasure at the University's having the opportunity of being associated with such an important occasion, and the Rt. Hon. the Lord Mayor of Brisbane welcomed members to the city. An opening address was given by

The participants from metropolitan countries, and the Unesco consultant. Left to right: Dr. L. G. Derthick, United States; Mr. F. R. J. Davies, New Zealand; Mr. A. P. Anderson, Australia; Dr. N. Perquin, The Netherlands; Mr. L. Faucon, France; Sir Christopher Cox, United Kingdom; Dr. F. H. Walter, Unesco consultant.

SPC REGIONAL EDUCATION SEMINAR: List of Participants

Mr. A. P. ANDERSON, Chief Education Officer, Commonwealth Office of Education, Sydney, Australia.

Mr. M. J. BAY, Chief Inspector of Schools, Fiji.

Major G. F. BOVEY, M.B.E., Chief Education Officer, British Solomon Islands Protectorate.

Mr. P. de BRUIN, General Administrator of the Protestant Mission School in Netherlands New Guinea.

Rev. Dr. A. CAPELL, Reader in Oceanic Languages, University of Sydney, Australia.

Sir CHRISTOPHER COX, K.C.M.G., Educational Adviser to the Secretary of State for the Colonies, London, U.K.

Mr. F. R. J. DAVIES, Officer for Islands Education, Wellington, New Zealand.

Dr. L. G. Derthick, United States Commissioner of Education, Washington, U.S.A.

Very Rev. Fr. J. DWYER, M.S.C, Rabaul, Territory of Papua and New Guinea.

Mr. L. FAUCON, Inspector-General of Schools, Paris, France.

Mr. A. FOWLER, Education Officer, British National Administration, New Hebrides.

Dr. Robert E. GIBSON, Director of Education, Trust Territory of the Pacific Islands.

Rev. Fr. P. C. HOEBOER, Provicar of the Roman Catholic Vicar Apostolic of Merauke, Netherlands New Guinea.

Rev. E. G. JANSEN, Principal, Tangoa Training Institute, New Hebrides.

Mr. Siméon KRAUSER, Schoolteacher, Tahiti, French Polynesia.

Mr. J. LEGGAT, C.B.E., Director of Education, Western Samoa.

Dr. C. LIJESEN, Director of Cultural Affairs, Hollandia, Netherlands New Guinea.

Mr. R. D. McEWAN, Director of Education, Cook Islands.

Mr. E. P. W. MARRIOTT, Editorial/Administrative Officer, Literature Production Training Centre, South Pacific Commission.

Mr. Robert MARTIN, Inspector of Primary Schools, French National Administration, New Hebrides.

Mr. Henri PAYONNE, Director of Education, New Caledonia.

Dr. N. PERQUIN, Director of the Hoogveld Institute, Nijmegen, The Netherlands; Professor of Pedagogical Psychology, State University of Utrecht.

Mr. G. PITKEATHLY, Chief Education Officer, Gilbert and Ellice Islands Colony.

Mr. G. A. PITTMAN, Director of Education, Nauru.

Mr. D. Bruce ROBERTS, Director, Literature Bureau, South Pacific Commission.

Mr. G. T. ROSCOE, Director of Education, Territory of Papua and New Guinea.

Dr. Richard SEDDON, Executive Officer for Social Development, South Pacific Commission.

Mr. Marvin J. SENTER, Director of Education, American Samoa.

Mr. John R. TRACE, Director of Education, Guam.

Mr. Talusa TUITELE, Special Assistant in Education, American Samoa.

Dr. F. H. WALTER, Programme Specialist for the teaching of foreign languages, Unesco, Paris, France.

Professor F. J. Schonell, Dean of the University's Faculty of Education.

Working Procedures

The Seminar, having speedily agreed on its working procedures, got straight down to work in its consideration of the items of the approved agenda.

Working papers had been prepared within territories and by Commission officers, and these provided many useful points for discussion. The method adopted was for each item of the agenda to be introduced by a member and then for it to come under free discussion by the Seminar working as a committee of the whole.

The official languages of the Seminar were English and French, and simultaneous interpretation was provided throughout to ensure the effective participation of all members. Similarly all documents were circulated in both English and French.

Main Topics Discussed

Problems relating to a balanced development of an education system, with special attention devoted to the provision of varying types and levels of education in relation to the occupational needs of a territory, were considered in detail against the background of a limited budget.

The encouragement and recruitment of suitable candidates for training as teachers, the in-service care and further training of teachers, and the use of broadcasting and other means of extending this care were aspects in which the interchange of experience proved to be most useful.

Seminar officials. Left to right: Dr. Richard Seddon, Executive Officer for Social Development, South Pacific Commission, who was administrative director of the Seminar; Major G. F. Bovey, M.B.E., Chairman; Dr. Robert E. Gibson, Deputy Chairman.

Questions relating to the effective use of an educational aids service in an expanding educational system occupied the attention of the Seminar for some time before it turned its attention to methods of language teaching. This topic, introduced by the UNESCO consultant, proved to be of absorbing interest, and the recommendations of the Seminar in this field could well mark a significant turning point in language teaching in the Pacific.

Possibilities Of SPC Assistance

Finally, the Seminar gave its attention to ways in which it considered the Commission itself could be of direct assistance to territories in their efforts to meet the challenges of education.

In the report that was adopted by the Seminar in its final plenary session for transmission to the Commission are a number of clear and precise recommendations defining activities for the consideration of the Commission. These will be considered by the Commission at its next session.

Seminar Considered Highly Successful

The Seminar, the first of its kind in the South Pacific, is considered to have been particularly successful. This opinion is supported by the following statements of the Seminar itself—

"The South Pacific Commission Regional Education Seminar, in expressing its appreciation to the Commission for what has proved to be a most valuable opportunity for its members to exchange views and ex-

perience and to discuss problems of general concern, believes that the objectives of the Seminar have been substantially achieved.

"The Seminar considers that its meetings have been of tremendous value, not only in the discussion of the very important items on the agenda, but also in the informal discussions that have taken place over many long hours outside the formal sessions and in the personal contacts made between members from territories with similar or inter-related interests. The Seminar has provided an opportunity for metropolitan representatives to obtain a more complete picture of the educational problems in the South Pacific territories today than would have been otherwise possible."

Housing Estate For Suva Workers

(Continued from page 24)

There are small additions such as proportion of the costs of subdivision of the land, road and footpath construction, and the installation of electricity. Tenants are required to pay town rates and charges for the consumption of electricity and water at their houses. A deposit of £25 is required from each tenant prior to occupation.

In addition to keeping their homes and gardens neat and tidy, tenants are required, under an agreement of tenancy, to trim grass verges and the hedges surrounding their houses. The Authority has gone to some pains to make the Estate attractive, and the initial enthusiasm which has been engendered into the occupiers indicates that they are more than ready to play their part in this.

Those tenants who fulfil the probationary period satisfactorily and prove themselves to be good citizens will be given the chance to purchase their houses over a period of 20 years. In this case all rent previously paid is credited to the purchaser's account.

Lectures For Prospective Tenants

In the few weeks preceding the occupation of the pilot project houses, the Housing Authority went to considerable trouble to prepare its tenants for their new lives. Husbands and wives attended a series of informal lectures. These dealt briefly with the development of the Colony of Fiji over the past three-quarters of a century; and in particular, the growth of the town of Suva and the factors which helped to bring about the present-day problems of overcrowding and insufficient housing.

It was stressed that the Housing Authority's estate must be run on a strictly economic basis and that there was no question of any subsidy being available to aid the residents: a tenant who could not meet financial commitments would have to quit, and for the sake of all concerned the sooner the better. The necessity for continuity of employment, thrift and safeguarding of health were urged; and the point made that repayments on a house were, in fact, an investment of part of a worker's wage in something of permanent value to him.

Racial intermixing is encouraged, but not to the point of making tenants over conscious of the need for it. The construction of a community centre is high on the priority list, together with shops, playgrounds and other amenities. A non-denominational chapel may soon be made available in which tenants of any race may worship. Occupiers are being encouraged to take an interest in solving many of the local problems which will beset them. For this purpose committees are being formed. These will meet under the chairmanship of a representative of the Authority in the early stages. To foster healthy competition, the Authority will sponsor competitions—for the best flower garden, the most public-spirited citizen and so on. Arrangements have been made with the Medical Department for the Mobile Child Welfare Clinic to visit the Estate fortnightly.

Much public interest and goodwill has been shown as a result of the Housing Authority's imaginative and energetic beginning at Suva. The pilot project has been followed by 14 houses of an entirely different design. Now a start is being made on the development of the third stage. This will provide a further 22 detached cottages, similar to the pilot project house, but embodying modifications in the light of experience. The complete building-up of the Raiwaqa Estate is expected to occupy the next two to three years, when 200 to 250 houses will have been constructed.

Similar Scheme For Lautoka

But Suva is not getting all the consideration. Under the Housing Ordinance the Authority is empowered to extend its activities to Lautoka, the next largest, next most industrialized town in Fiji. A start has been made on this, and an area of 12 acres of land at Lautoka has been made available to the Authority by Government. A preliminary layout plan of the Lautoka Housing Estate has been approved by the Lautoka Town Council and construction of the first 20 houses is expected to begin in the near future. The completed estate will consist of 80 to 100 houses of varying types, constructed around three landscaped open spaces. As at Suva, a community centre, shops and other amenities will be provided.

A Wild Tobacco Of New Caledonia

In the QUARTERLY BULLETIN *for July, 1958, it was mentioned that the seeds of a wild species of tobacco,* Nicotiana fragrans *Hook. var.* fragrans, *had been collected in New Caledonia and the Loyalty Islands by the SPC Plant Collection and Introduction Service at the request of research agencies engaged in tobacco-breeding programmes.*

More recently this service was able to fulfil requests for another wild tobacco of New Caledonia, Nicotiana debneyi *Domin., found in sandy coastal areas near Noumea (pictured). These requests came from tobacco breeders who require the seeds for genetic studies, and from C.S.I.R.O. research workers in Australia specializing in the improvement of tobacco.*

This species of Nicotiana *has an interesting historical background. It was first collected in the New Caledonian archipelago by* J. R. & G. FORSTER, *the naturalists who were with Captain Cook when he discovered these islands. The plant is not found only in New Caledonia, however; it also grows in some areas of Australia.*—J. BARRAU.

Shell measurements being made by the author (right) and recorded by Mr. Stan Hynd, Australian marine biologist. The 42,000 measurements recorded are being analysed in Australia.

SPC Sponsors Pearl Shell Investigation In Cook Islands

Last year the Commission sponsored a three-month pearl shell investigation in the Cook Islands by a marine biologist from Australia. An account of the work carried out is given below by the Fisheries Officer of the Administration . . .

RONALD POWELL

ALTHOUGH the pearl shell industry in the Northern Cook Islands has been lucrative during the past ten years, very little is known about the optimum conditions of shell growth and many other apparently simple factors on which the continuation and development of the pearl shell grounds depend. Certainly more knowledge is needed before they can be extended.

The *SPC Quarterly Bulletin* for January 1959 carried a description of the preliminary work started in 1958 This comprised laying out collectors, checking the settlement of spat each month, and estimating the maturity of the gonads of regular monthly samples of oysters. An attempt was made to estimate the growth rate by laying out wire cages in which measured shells were planted.

Little information was available to us when this work was started, and it soon became apparent that a more scientific approach to the problem was necessary before accurate data could be assembled from these preliminary trials.

Marine Biologist Makes Special Study

During 1959 the South Pacific Commission and the New Zealand Government assisted with this project. The former body arranged with the Commonwealth Scientific and Industrial Research Organization in Australia for the services of a marine biologist, Mr. J. S. Hynd, to be made available to us for a period of three months.

Mr. Hynd is the Director of the Fisheries Laboratory at Thursday Island, where the C.S.I.R.O. has been working on a similar project with the Australian goldlip shell (*Pinctada maxima* J.). His scientific papers are well known, and he was able to bring to bear a lot of sound practical experience gained in the Torres Straits area which will make our present project much simpler and the results more quickly available.

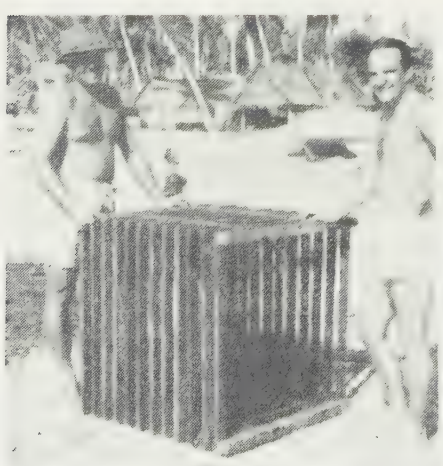
Mr. Hynd arrived in Rarotonga early in April, 1959, and much of the collecting gear was made in Rarotonga just before we left on the M.V. Dobiri later in the same month for Manihiki.

Manihiki is a coral atoll in lat. 10°S., long. 161°W. At first sight most people gain the impression that it is similar to hundreds of other atolls in the eastern Pacific. Whether in fact this is so is now very doubtful.

The climate during most of the year is excellent, with a steady easterly trade wind and a lagoon temperature of close to 85°F. The trades blow quite strongly at times, and there is generally a heavy surf on the weather side of the atoll, but as there is no deep break in the reef there is practically no current in the lagoon. How these conditions affect the water in the lagoon and allow pearl shell to grow so prolifically has not yet been determined.

Spat Collection Difficult

During the first year's work in 1958 the problem of collecting spat proved difficult. Readers may have read of the work which was done at the beginning of this century by the late C. Crossland, who succeeded in growing pearl shell commercially in the Red Sea. The



Extreme left: One of the new spat collectors made to Mr. Hynd's design. Each comprises twelve standard frames three feet square made of timber covered with wire netting, the latter being coated with a mixture of sand, cement, and "flintkote". Left: "Aging" collectors.

Diving cutter, about 28 feet overall length, and with wide beam to accommodate pump (a Seibe Gormen, which the author believes has changed little in design from the original, developed about one hundred years ago). At right is a typical small cutter of the northern Cooks. Note odd-shaped mainsail-aspect ratio reversed.

Japanese have also succeeded in growing pearl shell on collectors, and it appeared that this might have been comparatively easy in Manihiki. In practice it has since been found that the spat of *P. maculata* are much more numerous than the spat of *P. margaritifera* (the blacklip oyster). The difficulty will be to separate the two varieties.

New Collectors Built

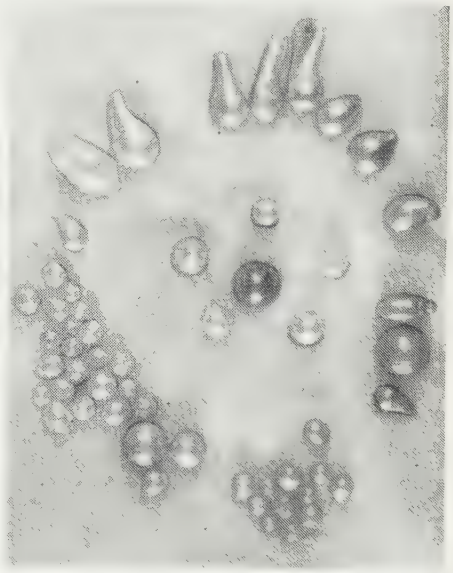
Last year, new collectors were built to Mr. Hynd's design. These are made up of units of twelve standard frames. Each frame is three feet square, and is made of timber covered with wire netting, the latter being coated with a mixture of sand, cement and "flintkote". The frames are assembled with long tie rods which allow them to be taken apart easily for the counting of the spat

The collectors were made up in pairs, and were hung from the same raft that was used in the previous experiments. One pair was hung at the surface, a second pair was suspended on rods at seven fathoms, while a third pair was laid on two concrete beams on the bottom in sixteen fathoms. An area of good shell bottom was chosen.

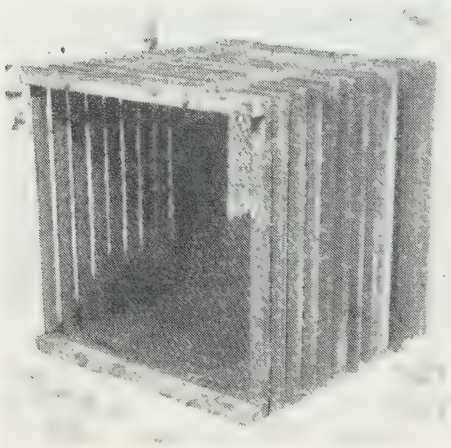
Mr. Don Bryan, the Resident Agent in Manihiki, has taken a keen interest in the project, and his lagoon assistant, Tekake Williams, who is the best skin diver in the Cook Group, soon learned the practical side of all the work undertaken. Tekake found no difficulty in laying out the concrete beams and attaching the collectors in sixteen fathoms by skin diving. He worked at that depth so easily and so often—apparently without much effort—that there was no difficulty in believing that he had gathered shell quite often from several twenty-fathom patches by skin diving.

Collectors Changed Every Month

These collectors are changed every month, and the spat counted. A further fifty shells will be gathered from the



Right: Collection of pearls from Manihiki and Penrhyn lagoons made over a period of years by Mr. George Ellis. Below left: Lagoon assistant Tekake Williams, who worked on the project, is considered the best skin diver in the Cooks. He has often gathered shell at twenty fathoms (120 feet). Centre: The author, watched by Tekake Williams, cutting blocks from preserved gonads before despatching them to Australia. Right: Making the air hose fast and tying in waist of diving jacket, which is made from thick calico, doubled, and coated with linseed oil. Open sleeves control air buoyancy.



Close-up of one of the collectors used in the investigations. They were used in pairs, spaced with timber and ballasted with cement blocks.

lagoon and the gonads examined and "staged" for maturity. The gonads will be preserved in Bouin's Fluid and blocks cut from them which will be further checked microscopically in Australia each month.

Fifteen hundred shells were collected both by skin and machine divers. These covered the full range of shell that is available above the twenty-fathom curve. Full measurements — twenty-eight per shell — were recorded, nearly 42,000 measurements being taken in all.

When these have been analysed statistically, much data will be available, and it will be possible to determine the best age at which to fish the shell without depleting the stock. This will be a big improvement on the present system of over-fishing, alternated by completely closing the lagoon for several years to effect a recovery.

The earlier difficulty of devising a practical way of measuring shell has now been overcome, and a new approach to the problem of growth adopted.

In 1958, we planted shell in cages. However, it was found that it does not grow very well under these conditions; in fact, a number of shells were actually smaller at the end of a year than they were when first planted. This surprising condition was caused by the handling which stopped the growth process without killing the shell. A new growth process then started inside the old one, and the shell then appears smaller as the old growth breaks off.

Thousand Shells Measured And Tagged

This year a thousand shells were measured and tagged with small serially-numbered plastic tags, attached with stainless steel wire. The shells were then spaced out on nylon ropes. Instead of being hung from the raft the ropes were anchored separately. A glass buoy two fathoms under the surface keeps the nylon tight. This has the advantage that it avoids the continual movement that comes from a raft pitching in rough water. These shells will all be measured again in twelve months.

We found that there had been a remarkable re-growth of shell, although in 1958 the lagoon seemed to have been almost fished out. The new shell appeared to come from the shell stock below the twenty-fathom curve, which is beyond the range of both skin and machine divers. But although there is obviously much young spat in the lagoon, it is difficult to find until it reaches nearly 3". We hunted underwater by skin diving and with the machine suit, but the spat is almost impossible to find although the visibility under water is exceptionally good.

Hydrographic Survey Carried Out

To attempt to estimate the present shell population of the lagoon it was necessary to know how much "good shell bottom" existed. Local knowledge here proved very unsatisfactory, and it soon became obvious that no one really knew what area of the lagoon could be fished as no chart had ever been made.

We started a hydrographic survey and covered roughly one-third of the lagoon area, taking widely-spaced soundings over the other two-thirds as well. It appears that about half the lagoon is beyond the reach of hand-operated diving machines. It will be necessary to know whether the shell does grow much below twenty fathoms, and it is hoped that some assistance may be available from the Royal New Zealand Navy in 1960.

Shell samples taken from this deep water, rather than from the area affected by fishing, would give more information on the natural mortality rate.

It will be interesting to know more about such conditions as the change in salinity which possibly occurs in a deep basin with but little tidal flow and where high evaporation takes place. The oxygen content, the change in temperature with depth, and the many related factors which make this a good shell-producing lagoon will all be valuable information which we hope to gather in 1960.

Commission Reviews Work Programme

(Continued from page 26)

The Commission's fisheries officers will continue to visit territories as requested, and to supply technical information and advice on marine and inland fisheries. They will also continue the introduction and study of fish species suitable for inland waters of the region.

The Commission will invite the Food and Agriculture Organization to collaborate with it in 1961 in running a sub-regional training course, either in Papua and New Guinea or the British Solomon Islands, on fishing methods, fish preservation, care of nets, and use of small, powered fishing vessels. The possibility of holding similar courses later in 1961 in other parts of the region will also be investigated.

Agricultural Extension Services

The Commission decided to approach the Food and Agriculture Organization of the United Nations for assistance in holding a meeting of senior officers of agricultural extension services in South Pacific territories, to discuss the development of agricultural extension work in the Pacific.

In the meantime, the Commission will continue to aid approved inter-territorial study visits by agricultural officers.

Nutrition And Diet

Last February a nutrition economist from Manila, Miss Manuela G. Maramba, arrived in Nouméa to work for one year on the Commission's nutrition programme, now directed towards the practical application of the results of the Commission's earlier research on the nutrition of Pacific island peoples.

Miss Maramba visited Fiji for discussions with nutrition specialists of the South Pacific Health Service, and has since studied nutrition problems in the United States Trust Territory of the Pacific Islands, Papua and New Guinea, and Netherlands New Guinea. Her main task is where necessary to suggest ways of gearing local food production to suit the nutritional needs of the people.

Research Council Meeting In 1960

The health members of the Commission's expert advisory body, the Research Council, will meet in 1960. They will give special attention to public health, health education, mosquito-borne diseases, nutrition and tuberculosis. Two specialist consultants, one in the field of nutrition, the other in that of public health, will be invited to attend.

New Commission Appointments

During the twentieth session, the appointment was announced of Dr. T. K. Abbott as executive officer for health, succeeding Dr. Emile Massal, who retired last April after ten years of service with the Commission. Dr. Abbott's last post was that of Assistant Director of Medical Services in the Department of Public Health, Papua and New Guinea.

At the closing meeting on October 23, the chairman paid high tribute to the work of Dr. A. H. J. Kroon, retiring executive officer for economic development, during his seven years with the Commission. He was succeeded by Dr. Jacques Barrau, previously SPC plant introduction officer.

Fig. 1 (top): Coconut palms uprooted in a sandy situation. Fig. 2 (centre): Palms stripped of most of their nuts and leaves by a severe cyclone. Fig. 3 (bottom): The result of wind pressure on palms situated near a high ridge.

Wind Damage To Coconut Palms

The temporary and permanent effects of high velocity winds on coconut palms are analysed and discussed in this study by . . .

N. G. CASSIDY*

THE coconut palm is normally a well-anchored tree, and provided it has a reasonable depth of soil to grow in, its roots are very seldom disturbed even by cyclones. Only in very sandy situations, as in Fig. 1, are trees likely to be uprooted. Nevertheless, very high wind velocities will strip off the nuts; and damage to the foliage is always likely to occur under extreme conditions. This is illustrated by Fig. 2.

After the severe cyclone which occurred at Suva in January 1952 some coconut palms growing just below the top of a ridge exhibited striking damage to their foliage. The whole of the top of the crown suffered a reversal of its normal arrangement, and all fronds were left hanging down in the position that is normal only for senescent leaves. This was clearly the result of pressure exerted on top of the crown as the wind swept over the ridge. Fig. 3 shows this effect on the crown of the palms.

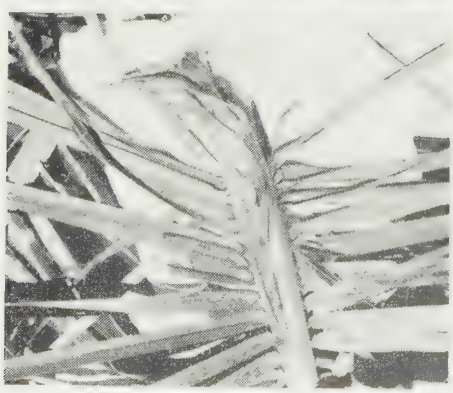
On this occasion the damage to the fronds was not investigated any further, but after the more moderate cyclone of December 1958, the fear of the unknown disease of coconut palms in the Philippines having caused some alarm to growers in Fiji, a more detailed examination of damaged palms was made in two areas. Observations were made in the same general area as in 1952 and these will be referred to later on.

At Telau Estate, on the western arm of Savu Savu Bay, an area of damage was surveyed. It consisted of about twenty trees which were showing damage

* Senior Chemist, Department of Agriculture, Fiji.

Fig. 4 (right): Damaged coconut palms on Telau Estate, Savu Savu Bay, Fiji.

Figs. 5-8 (below—top to bottom): Severe twisting, permanently impressed on leaf stalks by the wind. Parallel cracks on the lower side of a leaf stalk. Transverse break in a leaf stalk. A bursting open of the leaf stalk due to a twisting action.



to individual fronds but which were otherwise in good condition. As some of the palms were growing on an alluvial flat and others on the red sedentary soil of the adjacent slopes, there was not likely to be any primary effect due to soil or drainage conditions. The damaged trees amounted to only a small fraction of the tree population in the area. There was nothing in the colour of the leaves to suggest nutritional troubles, or in the insect population to suggest unusual damage by insects.

General Pattern Of Damage To Trees

The general appearance of the damaged palms was as shown in Fig. 4. The palm standing out high in the right centre exhibits depressed lower leaves, and one or two of the middle leaves are broken over.

The young leaves at the top of the crown are in their normal upright position. The adjacent palm is somewhat hidden in the photograph, but has the same general arrangement of its leaves. A careful study of the location of these damaged trees suggested that, to an observer facing the scene of Fig. 4, the damaging wind-flow came mainly from the flat area on the right and was deflected from the sharp rise in the land surface on the observer's left; it then moved across the trees in question and passed out of the gap shown in the distance. The trees in question were therefore in the streamline, and may possibly have suffered a greater twisting action due to the change of direction which took place when the wind was deflected from its original course.

The Individual Fronds

It was the middle fronds, those in the nearly horizontal position, which most commonly showed the breakage effect.

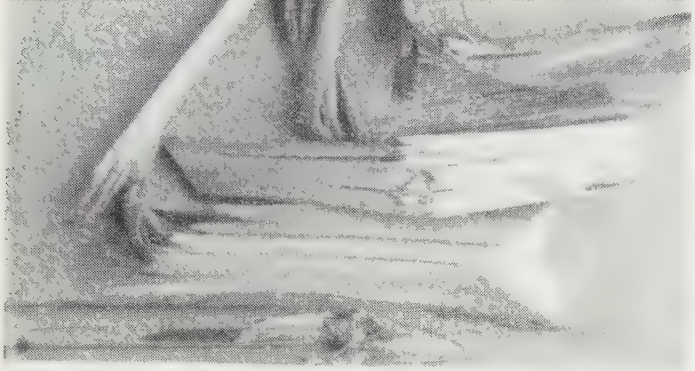
These are the leaves which are least able to relieve the strain of wind pressure by turning in any direction of wind-flow. The top group of young vertical fronds can bend towards any point of the compass, and are therefore not so subject to damage by wind-flow from any horizontal direction. It was also remarkable to observe during the 1958 cyclone, when the maximum wind velocity was moderate (but reached 98 miles per hour) that old senescent leaves, hanging down around the tree trunks, managed to survive because of this same flexibility.

Description Of Damage

At the highest wind velocities the leaf stalk may break off completely. Fig. 2 shows several such cases. The wind velocity that caused this damage was out of the range of the measuring instrument, but was estimated to be 150 miles per hour.

At more moderate wind velocities, or possibly where the air flow is turbulent rather than streamlined, damage begins with a twisting of the leaf stalk or petiole relative to the main bulk of the leaf. This is shown in Fig. 5, taken on Telau Estate, where the leaf on the left has suffered a twist through an angle of more than 90 degrees. The result of this stress is the development of two fine, parallel cracks on the lower side of the leaf stalk, as in Fig. 6. These splits allow the entry of micro-organisms and for that reason they become light brown in colour. Occasionally only one split instead of two is formed, presumably owing to a lesser stress on the frond. In Fig. 6 a short, third crack is shown alongside one of the other two, but this was not common.

When damage was more severe it took the form of a partial break across the leaf stalk and severe twisting of the stalk as shown in Figs. 7, 8 and 9, respectively. On the upper side of the leaf stalk a brown, superficial, mottling was observed in many cases (Fig. 10)



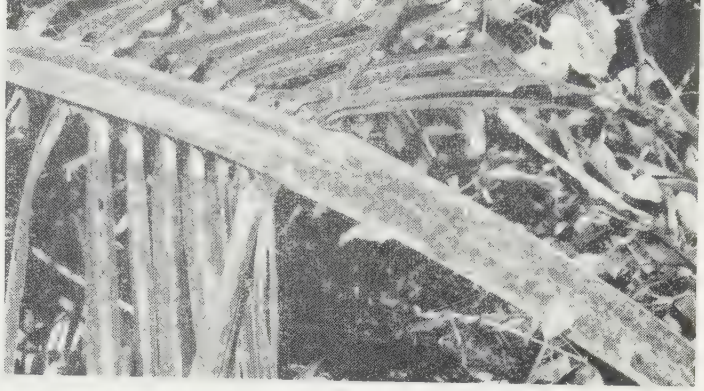


Fig. 9 (above): The results of turbulent rather than streamline flow. The leaf stalk with a clean knife-cut across it shows clearly the two parallel splits due to torsion. Fig. 10 (right): Superficial mottling on the leaf stalk due to a secondary fungus.

and this has been identified by the Commonwealth Mycological Institute as *clasterosporium* sp., a fungus which is known to occur in Papua and New Guinea[1] but is not suspected to be a pathogen.

The next degree of damage occurs when a leaf stalk is snapped off completely and the end portion is carried away. In a severe cyclone the break may occur close to the trunk, as already shown in Fig. 2.

It may be worth mentioning a much slighter form of damage which occurs when the stress is not sufficient to damage the leaf stalk. This takes the form of a ruffling of the leaflets, particularly those about the middle of the frond, so that they have a ruffled or "untidy" look, and do not hang in the same smooth and regular fashion as normal leaflets.

Finally it should be mentioned that, as shown in the illustrations, considerable damage can sometimes occur to the leaf stem without the leaflets being very much affected.

Causes Of Isolated Damage

Up till the present it has been assumed that isolated damage—that is to say, damage which is greater than that suffered by surrounding trees—has been caused by affected trees being in the streamlines of the wind. There remains the possibility that there may be predisposing causes of damage in the palm itself.

With this factor in mind one of the damaged palms on Telau Estate was felled and a careful examination made of all its parts. The soil was found to be well drained and the roots were healthy and full of sap. The tree was carrying about 25 nuts and appeared to be the tall variety of *Cocos nucifera* common in Fiji. Counts of leaf scars made on a section of the trunk about six feet from the ground showed a growth increment of 2.7 inches between scars whereas an adjacent palm showed 3.9 inches. The latter rate of growth is more normal: but many palms in Fiji do not reach such a growth rate.

In addition, chemical analyses were made of samples taken throughout the trees, for the major nutrient elements nitrogen, phosphorus and potassium. The following table shows leaves from the Telau Estate palm compared with the leaf standards quoted by Frémond.[2]

	Nitrogen (%N)	Phosphorus ($\%P_2O_5$)	Potassium ($\%K_2O$)
Telau Estate	1.39	0.28	1.57
Frémond's Standards ..	1.70	0.23	0.54

Only the value for nitrogen is lower than Frémond's standards: but this standard seems rather high, as palms in Fiji bearing 50 and 100 nuts respectively have only shown a leaf nitrogen of 1.5% and in India a figure of 1.3% has been selected. It appears then that the affected palm at Telau showed no nutrient deficiency in phosphorus or potassium but was possibly very slightly deficient in nitrogen: the evidence does not give any reason to believe that the wind damage could be ascribed to a weakened tree, especially as abundant nitrogen is usually associated more with soft growth rather than with physical strength of the tissues.

Recovery

Much of the loss due to a cyclone is never made up. Nuts which have been torn from the tree are a complete loss as no crop will be harvested during the months when such nuts would have reached maturity. Leaves need to be replaced and as a new leaf is produced at about monthly intervals, it takes some time for the palm to attain its full complement of foliage. The author has observed storm-damaged leaves take on a grey colour and slowly progress downwards from their horizontal position in the crown until they are finally shed, almost a year after the storm took place. Once this has been achieved there appears to be no residual effect to a storm-damaged palm.

[1] Private communication from Dr. Dorothy E. Shaw, Pathologist, Department of Agriculture, Stock and Fisheries, Port Moresby.

[2] Private communication from Y. Frémond, Director, Port-Bouet Agricultural Station, Ivory Coast.

Hollandia Nautical School To Take Trainees From Papua And New Guinea

Arrangements have been made for a number of Papuans and New Guineans to be trained as seamen and marine engine operators at the Hollandia Nautical School in Netherlands New Guinea. While training will be mainly practical, there will be limited tuition in theory to give students the necessary background for their technical training.

The course will provide a year's pre-sea training, and youths who reach the required standard at the end of the year will be issued with a certificate stating that they have successfully completed the course.

Each trainee will be provided with uniform, rations and accommodation at the School, and will be paid at the trainee rate of £16/5/- a year.

The first group of trainees will be limited to twelve. Six will be trained as seamen, and six as marine engine operators.

Further Training For W. Samoa Health Services Personnel

Among those attending the first of the post-graduate courses at the new Nuffield Department of Public Health and Social and Preventive Medicine at the Central Medical School, Fiji, this year, will be two medical practitioners from Western Samoa. They will be just two of several Samoan medical, dental and nursing students who are being offered further training in Fiji and New Zealand in 1960.

Two nurses will attend the recently-established nurses' training school in Fiji, where they will have the chance to qualify at the full New Zealand state registration standard, while three students will go to Suva Medical School to train as medical practitioners. Two more will also go to Fiji to qualify as Assistant Dental Officers.

Another Samoan medical practitioner, I. Sosene-Feagai, one of the territory's two delegates to the fourth South Pacific Conference held under SPC auspices at Rabaul earlier this year, will probably spend three months in New Zealand studying ophthalmology.

Above: Some of the health staff and child welfare members on Rarotonga whom the author accompanied on a village inspection. Makea Karika Takau Margaret Ariki, who attended the last South Pacific Conference, is second from left, back row. Right: Mrs. Arieta E. Mulitauaopele, Chief Public Health Nurse (centre row, extreme right), with District Nurses, taken near the Public Health Office at the end of the training course in health education, held at Pago Pago Hospital, American Samoa. Mrs. Mulitauaopele attended the health education training course held under SPC-WHO auspices in Noumea in 1957.

Polynesian Journey . .

During a recent ten-week visit to the Cook Islands and American Samoa, the Commission's health education specialist worked closely with the health and education authorities in the planning of their health education programmes, and assisted with training courses for their staff personnel. As well, she explained the purpose and value of health education in talks to women's clubs, nurses, women's health committees, and co-operatives.

By LEONIE J. MARTIN

LAST August, after a brief stay in Nouméa, I again set out, this time for Polynesian territories. My route took me first through Fiji and Western Samoa to the Cook Group, that widely-scattered cluster of islands inhabited by Maori people.

Two Weeks At Aitutaki

The flying-boat lands at Aitutaki with its wonderful lagoon, and here I spent the first two weeks. Part of the time was spent working with health and education staffs, helping them to develop health education methods and tools so that they may continue to use these with their own people. But there was time here to spend with the *Au Vaine* (the Women's Clubs).

Miss Marjorie Stewart, the Commission's Women's Interests Officer, left three days after my arrival to attend a conference in Fiji; but Miss Judy Lang, a nutritionist with the South Pacific Health Service, was working with the clubs, mainly giving cooking demonstrations and nutrition talks. Together with the senior Assistant Medical Officer it was possible to develop a combined health and nutrition programme for the clubs for the time we were together.

The evenings were divided between health and education staffs and the Co-operatives. For the staffs we showed film strips and discussed ways of using these for teaching. With the Co-operatives, we showed health film strips and had talks and discussions following on their usual meetings. For both Clubs and Co-operatives there would seem to be a great potential for further health education. Both are interested, and keen to learn more.

Miss Judy Lang, nutritionist with the South Pacific Health Service, demonstrating the cooking of peanuts to the Tautu-Vaipae Women's Club. On the extreme left (back to camera) is Miss Ina Robati, secretary/interpreter for the SPC women's interests projects, located on Aitutaki.

Month's Stay On Rarotonga

The Calibration plane took me to Rarotonga, where I stayed for almost a month. Time was spent with the teacher trainees at Nikao Training College and with some of the teachers from the Rarotonga schools. Efforts were made to develop means whereby health education methods and techniques might be improved, and to find ways in which

Above: Ao'a Women's Health Committee outside their fale just before a meeting. Tutuila Island, American Samoa. Mrs. Arieta Mulitauaopele, Chief Public Health Nurse, is at right front. Right: Parents' Day at Ngatangiia School, Rarotonga. Grade II children are performing a Health Play on the rules for healthy living, all done with song and dance as an action hula hula. Here they are cleaning their teeth.

health could be brought in to other aspects of school work as well.

It was heartening to find before I left that two schools had commenced asking the children to bring play-lunches and encouraging them to use for these their own native foods.

The health staffs of course were very keen to learn all that they could of health education methods, particularly those in the Public Health Section. But hospital staff, too, especially those from the Sanatorium, attended whenever they could. One of our biggest problems was to find enough space, and enough time to spend with everyone.

Public Health staffs and the women's Child Welfare Committees in the villages work very well together. I was fortunate to be able to spend one day on a *tutaka* with them. This is a house-to-house visit throughout the whole village, inspecting for general cleanliness and for particular health hazards. Is is a valuable part of public health work.

On To American Samoa

My trip back to Aitutaki was on a small inter-island trading boat which took 22 hours to do the trip that the plane had completed in less than an hour! At Aitutaki there were final visits to most of the Clubs and of course an *umukai* (feast) at each one. I left again by plane for American Samoa and Pago Pago—R.L.S.'s "long-elbowed harbour".

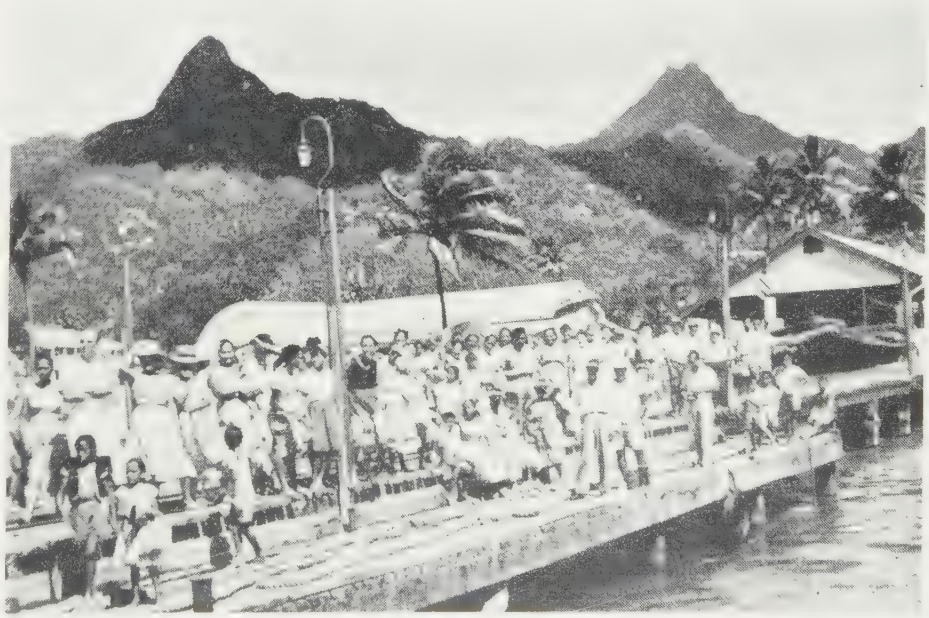
Tutuila Island is volcanic and extremely mountainous with very little flat land and only a narrow edge of coral reef. Mountain sides are steep, and since there is a rainfall of something like 200" a year, usually slippery.

My work with the Health Department took me to some of the villages on the northern side of the island where there are no roads. To visit the Women's Health Committees and talk to them necessitated either a long climb over the mountains or a lengthy trip around the island, usually in a flat-bottomed 50' barge. Landings were made in a *pao pao* across the reef, though in one place where it was too rough for this, some of the health staff swam ashore!

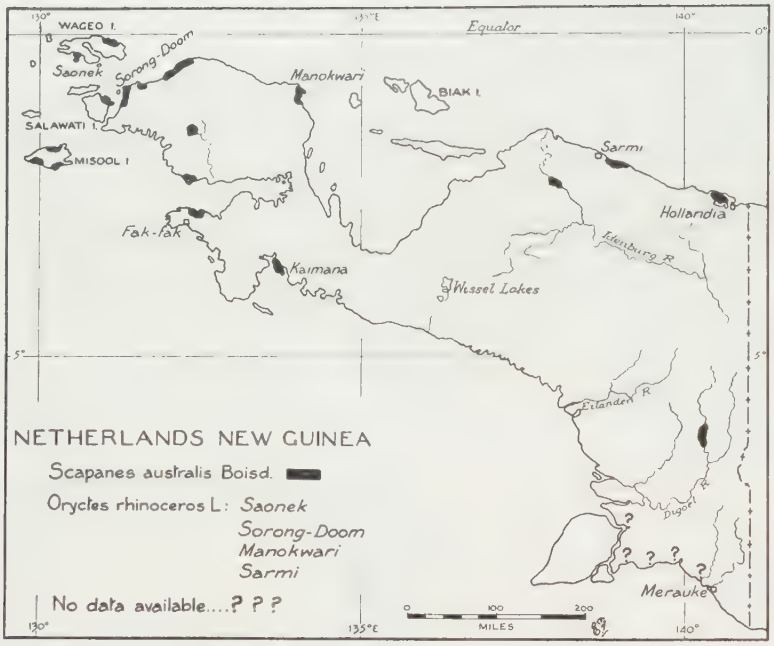
The work of the Public Health nurses is made much more difficult by the comparative isolation of most of these northern villages. Even though there are two Samoan Medical Practitioners working as District Medical Officers, it takes time and effort either to get to a patient or to bring one in to the hospital. Hence a great deal of responsibility may fall on the shoulders of the nurse. Over the last few years, Women's Health Committees have been, and are being, established in each village to assist with health work and to help in the general

(Continued on page 66)

Governor Peter Tali Coleman of American Samoa and High Chiefs arriving for the opening of the Women's Health Committees' meeting, held in Pago Pago on October 30 last.



The author took this photograph of the gathering on Rarotonga wharf from the "Dobiri" as she sailed for Aitutaki. Many of the health staff and child welfare members came to see her off.



A NOTE ON . . . .

Coconut Beetles Of Netherlands New Guinea

Two coconut beetles that appear to be firmly established in Netherlands New Guinea are ORYCTES RHINOCEROS L. *and* SCAPANES AUSTRALIS *Boisd. However, fortunately neither seems to be flourishing, and overall damage to the coconut crop is negligible.*

By R. T. SIMON THOMAS*

TO the writer's knowledge it has only once been mentioned in the literature that *Oryctes rhinoceros* L. is found in Netherlands New Guinea. Leefmans (1920) gave a survey of occurrence of this pest on the large islands of Indonesia, and even on some of the Moluccas, but he was not sure that there were any in New Guinea. Preuss (1911) thought that the place of *O. rhinoceros* L. was taken by other dynastids such as *Scapanes australis* Boisd. and *Sc. grossepunctatus* Sternb. Hoyt (1959) stated that *Oryctes rhinoceros* L. was present in several localities in Netherlands New Guinea, although it was not known when these introductions took place.

And yet there is a female of *O. rhinoceros* L. in the collection of the Entomological Museum at Amsterdam with the label: "Nieuw Guinea, Doreh, 1908, Coll. van den Bergh". (Doreh is the name of the bay on which the old settlement of Manokwari is situated). In the middle of the nineteenth century there was regular trading between the Moluccas and Manokwari, and even cattle and plants were imported (Galis, 1948). Thus it is easy to believe that *O. rhinoceros* L. had found its way to Netherlands New Guinea many years ago.

ORYCTES RHINOCEROS L.: The distribution in Netherlands New Guinea of *O. rhinoceros* L. is shown on the accompanying map. A study of it reveals that the rhinoceros beetle is found only in rather large villages — never in or around smaller native settlements.

Oryctes rhinoceros L. was collected from Saonek and Sorong-Doom (Simon Thomas, 1957), both small islands with dense populations and consequently with abundant waste from household and garden. All coconut palms on both islands have been attacked by the rhinoceros beetle, quite a number even being dead.

O. rhinoceros L. was also collected in the small towns of Manokwari and Sarmi. Many coconut palms in the centre of the former were heavily affected. In Sarmi, *O. rhinoceros* L. was quite common in the European living area, but very rare in the native area and found not at all in a small plantation outside the village (Simon Thomas, 1958).

SCAPANES AUSTRALIS BOISD: The distribution of *Sc. australis* Boisd. in Netherlands New Guinea is also indicated on the map. It may be observed that in the field, *Sc. australis* Boisd., though widely spread all over the territory, is limited to some small areas in the coconut region. There are hardly any coconut estates in Netherlands New Guinea. Most of the crop is grown by the natives along the coastline of the Radja Ampat islands, east of Sarmi and west of Merauke.

The largest number of *Sc. australis* Boisd. was caught in Sorong-Wal, on the mainland, using mercury vapour light. There were only very few coconut palms growing in the area. Many specimens of *Sc. australis* Boisd. were collected in small native villages. Because this species never occurs in large concentrations, serious damage is very rare. Only in one native village—Wey—was there damage of any significance due to this beetle.

Difference In Ecology

From the distribution of *Oryctes rhinoceros* L. and its preference for human settlements it can be concluded that this beetle is ecologically bound to man. The larvae breed best in waste from gardens and refuse dumps (Kalshoven, 1951). Actually, damage caused by this beetle can be correlated with the distance to the nearest refuse dump (Leefmans, 1920).

On the other hand, *Scapanes australis* Boisd. is always found outside villages and settlements, and it is evident that this beetle can live without any human association. (Actually, some larvae were once found in dead palms on an uninhabited island.)

From these facts it is clear that there is quite a difference between the ecology of the two species. The author does not agree with Preuss (1911) that the place of *Oryctes rhinoceros* L. in New Guinea was taken by *Scapanes australis* Boisd. Manokwari is the only place where both species were collected: one inside the centre and the other just outside the village.

Not An Economic Problem

The economic consequence of this pest for Netherlands New Guinea is negligible. The only places where the pest is found in any numbers is inside the large villages, where no copra is produced. It does not spread out to the plantations and native gardens. In the Radja Ampat, less than 1% of the coconut palms have been destroyed by *Scapanes australis* Boisd.

Because of the above, the Administration has asked the people to keep their gardens, plantations and villages clean of refuse. It is forbidden by law to leave

* Entomologist, Department of Economic Affairs, Netherlands New Guinea.

Top left: Scapanes australis Boisd. Dorsal view. Left, female; right male. Top right: Scapanes australis Boisd. Lateral view. Left, female; right, male. Lower left: Oryctes rhinoceros L. Dorsal view. Left, female; right, male. Lower right: Oryctes rhinoceros L. Left, female; right, male.

dead palms undestroyed in the gardens and villages.

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Land Use and Resource Survey of Western Samoa

THE land use and resource survey of Western Samoa begun in 1953 by the Department of Geography, University of Auckland, has virtually been completed. The project was financed by grants from the New Zealand Carnegie Social Science Research Grants Committee.

Between 1953 and 1957, eight members of the Department carried out field work in Western Samoa. Since then the results have been written up and maps prepared for publication. Archival research in New Zealand was continued in 1958 and 1959, and much original material brought to light. For the first time a coherent story of the German colony in the pre-1914 period appears, and its geographical implications in terms of present-day Western Samoa may be appreciated.

The results of the project are being published in a book entitled *Western Samoa: Land, Life and Agriculture in Tropical Polynesia.* The book, edited by Professor K. B. Cumberland and Mr. J. W. Fox, comprises twelve separate but related contributions, nine of which were written by those who shared in the project sponsored by the Carnegie Social Science Research Grants Committee. Two chapters have been contributed by workers from the New Zealand Soil Bureau and the New Zealand Geological Survey. Another chapter is contributed by a member of the Department of Geography whose field work was financed by the University of Hawaii.

The publication will include chapters on: Structure, Landforms and Hydrology; Weather and Climate; Vegetation; Soils; Population and Settlement; Agriculture to Mid-Century; Village Agriculture; Plantation Agriculture; Agriculture Outside the Village and Plantation Systems; A Regional View of Samoan Agriculture.

The book will be published early in 1960 by Messrs. A. H. and A. W. Reed of Wellington.

Plant Exploration And Introduction In Micronesia

The important part that plant introduction has played in the economic development of Micronesia is described in this article, which reveals that as early as the seventeenth century, Guam had become a centre of plant introduction activities in the region.

By JACQUES BARRAU*

Ponape agricultural experiment station, which was established originally by the Japanese Tropical Industries Research Institute. It was then the main centre for plant introduction in this part of Micronesia.

AMONG the earliest discoveries made by European explorers who first visited the Pacific Ocean during the sixteenth century were the Marianas, and some of the Caroline and the Marshall Islands. There, the first settlements of the newcomers were those of the Spanish missionaries, who began their activities on Guam in 1668.

From then on the colonial history of these Micronesian Archipelagos was a rather complicated one, of which here is an over-simplified sketch:

In 1564, Spain had already taken possession of the Marianas, but the other islands remained uncontrolled by European powers. They were, nevertheless, visited by traders, whalers and missionaries. Around 1885, as a result of rivalry between Spain and Germany, the Spanish flag was raised over the Caroline Islands, while Germany annexed the Marshalls. Then in 1898 the United States purchased Guam from Spain, which sold to Germany its other Micronesian possessions. Those territories were, in 1920, handed to Japan under a mandate from the League of Nations and, after the last war, they were placed under United Nations trusteeship, administered by the United States.

It can be easily understood that these contacts the Micronesians had with more advanced civilizations resulted in many changes, including some in the field of the economic flora of these islands. A number of useful plants were introduced by the newcomers who, at the same time, were actively looking for local species of possible economic value. This aspect of the history of the Micronesian islands is the subject of this article.

* * * *

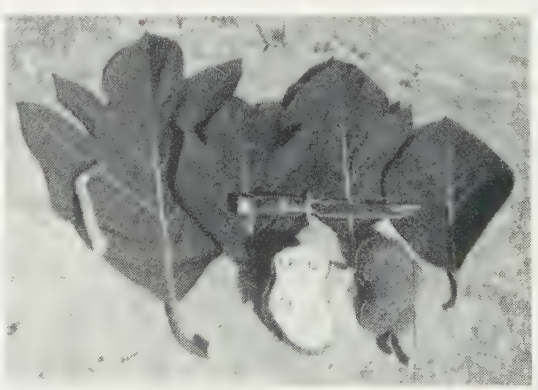
Early Plant Exploration And Introduction

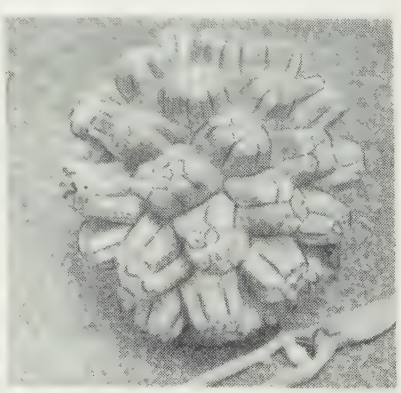
As in many other islands of Oceania, yams, taros, bananas, breadfruit and the omnipresent coconut palm were staple food plants in this part of the Pacific. The *Pandanus* with edible fruit (*P. tectorius*) was also very much grown and used on the low coral islands.

For many reasons it is worth while considering the pre-European economic flora of Guam in some detail: This island seems to have been the only one in the tropical Pacific where rice was grown before the Europeans arrived. The discoverers, Magellan in 1521, Legazpi in 1565, van Noort in 1600, L'Heremite in 1625, mentioned that rice was offered to them, together with the common vegetable foods found in all the Pacific islands.

In addition, Le Gobien in his *History of the Marianas Islands recently converted to the Christian Religion* published in Paris in 1700, wrote that rice was grown by the Guamanians. They were also using commonly as food the fruit of *Cycas rumphii*, locally known as FADAN or FADANG, which needed a long and careful process to make it edible, as it contains a highly toxic glucoside which has to be eliminated by cooking and washing the grated fruit several times.

It could be of interest to mention here that one of the first European descriptions of the breadfruit was made on Guam by Dampier in 1698. Besides the normal breadfruit tree, one finds on this island a wild relative of this food plant.





Above: The wild seeded breadfruit of western Micronesia. Right: Edible fruits of Pandanus tectorius, an important food plant of Micronesia.

* Executive Officer for Economic Development, South Pacific Commission.

This is called DUGDUG by the Guamanians, while the ordinary breadfruit is known as LEMAE, LEMAI or RIMA.

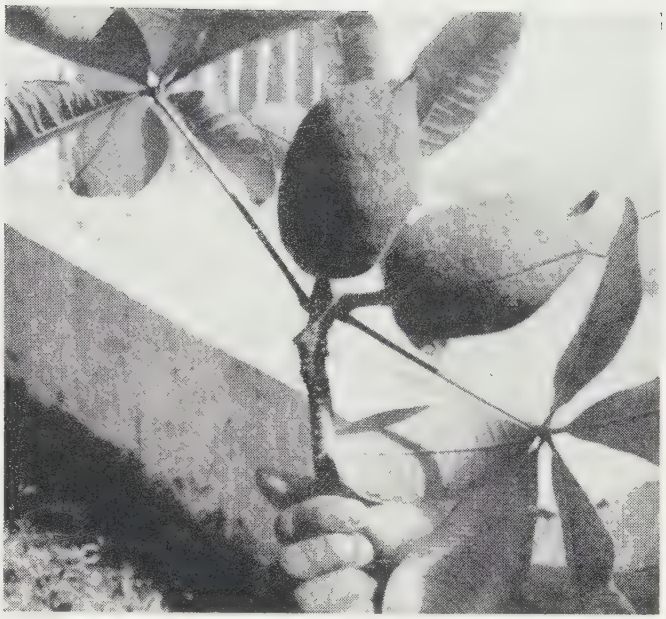
The DUGDUG, which the botanists called *Artocarpus mariannensis,* has entire or almost entire leaves, and its rather small fruit contains large seeds. In spite of its botanical name it is not found only in the Marianas, but also on almost all the islands of Micronesia. This pre-European distribution is probably due to man, who brought the DUGDUG from island to island together with the breadfruit. However, *A. mariannensis* seems to be truly wild on Guam and also in the Palaus. It could very well be one of the parents of the cultivated breadfruit which seems to be of hybrid origin. (A little-known fact about the Guamanian breadfruit is that, fifteen years before the famous expedition of H.M.S. BOUNTY, the French explorer Crozet collected some breadfruit plants in Guam in an attempt to introduce it into the island of Mauritius.)

As a matter of fact, from the seventeenth century Guam became an active centre of plant introduction. To give an example, corn brought from America by the Spaniards was already grown there as early as 1676. Another plant of American origin which was then introduced in this island was the sweet potato, which became a staple food for the Guamanians, who adopted also the use of its Mexican name, CAMOTE. In the case of the Western Caroline Islands, apparently the natives themselves introduced the sweet potato there; it appears that they brought it back from the Philippines, which they sometimes visited during their expeditions by canoe.

Guam was on the route of the Spanish galleons which sailed across the Pacific linking Central America and the Philippines. This explains why so many plants of American origin were introduced into this island, where they still bear their American vernacular names. Such is the case of the yam bean, *Pachyrrhizus erosus*, called HIKAMAS; various *Amaranthus* known in Guam as KILETES; the peanut *Arachis hypogaea*, or KAKAHUATE, etc.

Cash crops such as cocoa were also introduced there in Spanish days, which saw some rather ambitious agricultural ventures on this island, for instance the ill-fated *Sociedad Agricola de la Concepcion*. As agricultural workers for these projects, convicts were brought from the Philippines. However, this was quickly discontinued as there were not enough guards to ensure discipline. Next, Japanese labourers were imported. This also was a failure, and the end of Spanish attempts to develop commercial plantations on Guam.

The purchase of Guam by the United States in 1898 did not slow down plant introduction activities on the island.



The Guiana chestnut tree (Pachira aquatica), one of the many useful plant introductions at the Ponape agricultural experiment station.

Moreover, a U.S. Navy officer who was also an excellent botanist was fortunately stationed on this island at the beginning of the present century. His name was W. E. Safford, and during his stay on Guam he made a survey of the island's economic flora. The results of his work were published in 1910 as a book entitled *The Useful Plants of Guam—with an introductory account of the physical features and natural history of the island, the character and history of its people and of their agriculture.* It remains today a model for any economic botany survey.

Coconut nursery on Murillo Atoll, Truk District.

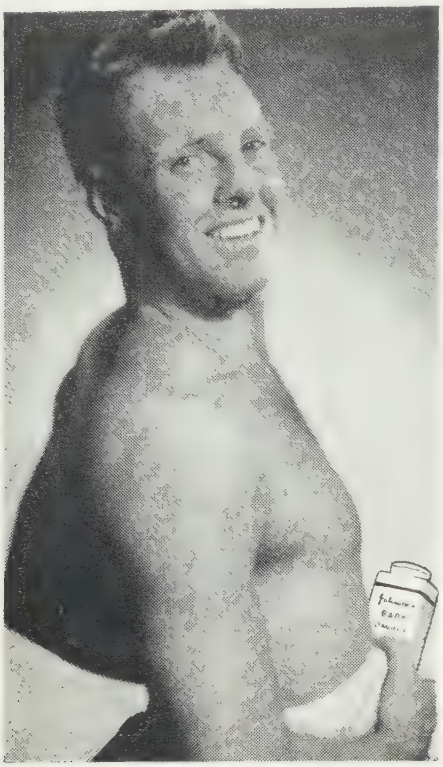
* * * *

Plants And Men In Twentieth Century Micronesia

In Guam, some years after its purchase by the United States Government, the United States Department of Agriculture created, in 1909, an agricultural experiment station which worked continuously up to 1932.

Although a number of changes to the research programme of this station were made during its twenty-three years of work, the observations made and the data collected are of great value. They were fortunately published annually in Washington by the U.S. Department of Agriculture, and this series of *Annual Reports of the Guam Agricultural Experiment Station* deserve to be known by all those interested in agricultural research in the South Pacific islands. Hundreds of species and varieties of economic plants were introduced and tested on this station.

In the then German-controlled islands, useful plants were also introduced. Among them is a *criollo* cacao strain, looking rather like *Theobroma pentagona* of Guatemala, Nicaragua and the Caribbean area; it can still be found today on Ponape where, according to the local tradition, it was introduced in German days from Tahiti. This is quite possible as, at the end of last century, the "Jardin Raoul" in Papeete was actively propagating and distributing cacao seedlings. In those days, ships were sailing from one archipelago to another across the Pacific, and Christian in his book *The Caroline Islands,* published in 1899, mentioned the presence of a schooner from Tahiti visiting Ponape rather regularly.



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When the German-controlled islands were handed to Japan in 1920 there began an era of intensive agricultural research, and a large number of useful tropical plants were introduced for testing. In the meantime, surveys were undertaken of all possible economic uses of local plants. Several experiment stations were set up, the main one in Ponape, and many cash crop development schemes were launched.

Sugar cane became the object of an important industry in those of the Mariana Islands which were controlled by Japan; pineapple was grown commercially; cacao plantations were established; while coffee was also introduced and propagated. In addition, these islands exported about 15,000 tons of copra in 1938, and the commercial growing of cassava was also important on Ponape.

These outstanding agricultural developments were in great part the results of the activities of the Japanese Tropical Industries Research Institute. Besides its agricultural research and among other subjects of study, this Institute undertook also quite a lot of work in the field of forestry, introducing and propagating foreign species, while the economic possibilities of local forest trees were also surveyed.

As examples of the many ventures which then took place in Micronesia may be mentioned the commercial cultivation of *Piper methysticum* — used to prepare medicinal drugs—and the tapping of *Manilkara udoido*, a wild Sapotacea tree common in the Palauan forests which yields a gutta-percha like latex.

Unfortunately, a considerable part of this work was lost during and after the last war. Then the United States Administration of the Trust Territory resumed work on some of the former Japanese agricultural experiment stations, mainly in Ponape and in the Palau Islands.

Meanwhile, a survey of what was left of the Japanese-established economic plants collection was undertaken, and in 1952, Mr. Bowman, Director of the Turrialba Cacao Centre, Inter-American Institute of Agricultural Science, was invited by the Administration of the Trust Territory to survey the surviving cacao trees found in the islands, as well as the potential planting areas where a development of this cash crop could take place.

As a result of Mr. Bowman's survey, efforts were made to develop cacao as a cash crop in the Trust Territory using the local cacao population as a source of propagation material. This population includes:

—One probably Central American *criollo* already mentioned and which resembles *Theobroma pentagona*. It has small, warty, thin-shelled pods containing loose, small seeds with white cotyledons. This peculiar cacao, which does not seem to be of economic interest, can still be found in some gardens of Ponape.
—Several *trinitarios* (hybrids between *criollo* and *forastero*).
—One with red, fairly large, warty, relatively thin-walled and high shouldered pods containing loose, round seeds with white cotyledons. This type of cacao was introduced by the Japanese from Java into the Palau Islands a few years before the last war. It is probably a form of the *Djati roenggo* hybrid from Indonesia. Besides the Palau Islands, this cacao was grown on Yap, while a few trees can be found on Saipan. It has been very much propagated during the past few years in the scope of this cash crop development scheme.
—One with large, furrowed, medium-to-thick-walled pods containing flattened seeds with reddish purple cotyledons.
—One with smooth, somewhat *Amelonado* shaped, rather thin-walled pods containing loosely-packed seeds with pink or reddish cotyledons. This cacao was apparently introduced from Rabaul by the Japanese before the last war.

The two last-mentioned *trinitarios* are present on Ponape Island, where they were grown originally on the Agricultural Experiment Station of the Japanese Tropical Industries Research Institute.

This Institute also introduced several species and varieties of coffee, including *Coffea arabica, C. canephora* and *C.*

(Continued on opposite page)

Young bearing cocoa tree planted on Truk under a cocoa development scheme being carried out by the Administration of the Trust Territory.

Above: Store of the first co-operative to be started on the Vatukoula Goldfields. The Welfare Officer of the Emperor Gold Mining Company, Mr. R. Yarrow (right), acted as guide to the Registrar of Co-operative Societies, Mr. F. E. M. Warner, and the author of this article during a visit to Vatukoula last November. Right: Customers of the Matanagata Co-operative Store receive smiling and efficient service from two young Fijian girls, who are the storekeepers.

Co-operatives Benefit Mine-Workers In Fiji

Three co-operative societies established during the past three years by mine-workers on the Vatukoula Goldfields in Fiji are proving highly successful.

By R. H. BOYAN*

INLAND from the King's Road which links Nadi Airport and Suva, along the north coast of Viti Levu, lie the Vatukoula Goldfields. Among the employees of the Emperor Gold Mining Company Limited are many Fijians and Rotumans whose home island lies several hundred miles to the north.

Although basic rations are issued by the Company, the mine-workers still have many expenses for food and other items. In an attempt to reduce their cost of living, three years ago a group of the Rotuman employees sought registration of a consumers' co-operative—the Rotuman Co-operative Store Limited. This was granted by the Registrar of Co-operative Societies.

The venture had the blessing and support of the Company, which advanced money for the construction of the store building. An indication of the successful operation of the Society is that this advance was repaid within a year.

Two Further Societies Formed

The success achieved by the Rotumans stimulated Fijian employees, who formed two societies to cater for groups living in different parts of the goldfield. The first was registered as the Loloma Fijian Co-operative Store Limited and the second as the Matanagata Co-operative Store Limited. Both also receive advances for the construction of store buildings.

The latter society has turned out to be the biggest, and sales for 7½ months of the current financial period totalled just under £6,000 Fijian. The sales of the Loloma Fijian Co-operative Store for nine months of the current period were £4,703, while the Rotuman Society is averaging about £380 per month.

All three societies buy stocks in the nearby town of Tavua at wholesale rates. As the stores are operated efficiently, expenses are kept low, and substantial surpluses have been shown since formation. Rebates of up to 1/8d. in the £ have been paid, and the actual amount distributed to members by the Loloma Society after the end of the last financial period was £201.1.6d.

An interesting feature of the Rotuman Society is that members may deposit sums of money with the Society until they have enough to buy such items as sewing machines. This means that thrift is encouraged, and members obtain useful assets at a lower price.

Not only did the Company support the ventures by advancing cash for the construction of stores but the Company's welfare officer, Mr. R. Yarrow, takes a keen interest in their affairs. (Recently he escorted the Registrar and the writer on a visit to the three stores).

Regular audit inspections are made by the members of the staff of the Co-operative Department.

No Credit Given

A feature of all three stores is that no credit is given. This is a vital factor in their success.

The receipt of regular wages and some rations undoubtedly helps in preservation of the rule, and a degree of isolation from village commitments helps. However, the main factor is the determination of the members themselves that credit shall not ruin their co-operative—as has happened so often in Fiji.

* Co-operatives Officer, South Pacific Commission.

Plant Introduction In Micronesia

(Continued from opposite page)

liberica, and many other economic crops such as the rubber tree, *Hevea brasiliense,* and even the sago palm from New Guinea, *Metroxylon rumphii.* Besides this species, another *Metroxylon* is endemic in Micronesia—*M. amicarum* of Ponape, of which the fruits were used at one stage as a source of vegetable ivory.

Finally, during the past few years, a considerable amount of work has been done in the Trust Territory of the Pacific Islands to improve its coconut industry. This has been undertaken with the participation of the well-known specialist, Mr. W. V. D. Pieris, formerly a member of the technical staff of the South Pacific Commission.

* * *

This very short account has shown that plant introduction has played an important part in the economic development of these Micronesian islands. This is still true today, and recently the SPC Plant Introduction Service has been able to be of some assistance in this field. Thus—to give an example—during the months of June, July and August, 12 species and varieties of economic plants were introduced into the Trust Territory of the Pacific Islands through the South Pacific Commission. These included several cacao selections, food plants, fruit, nut and forest trees. Many other requests for plant material from this territory have been received, and action has been taken to fulfil them.

Aerial Spraying Controls Coconut Stick Insect

The author, pumping insecticide into the Tiger Moth aircraft prior to the spraying of coconut palms

The coconut stick insect causes severe damage to palms on many Pacific islands. A promising method for its control, which hitherto has been difficult, has been tested on the island of Taveuni by the Fiji Department of Agriculture. Aerial spraying of a 100-acre plot yielded highly promising results.

By B. A. O'CONNOR*

THE coconut stick insect, *Graeffea crouani* Le Guillou, has been recorded by authors from the Caroline and Gilbert Islands, the New Hebrides, New Caledonia, Fiji, Samoa, Wallis Island, Futuna, Tonga, the Cook Islands and French Polynesia. In Fiji, one can always see signs of feeding by the insect on coconut palms throughout the islands of the Group, but it is only in certain areas and at certain times that severe damage is done. During the last ten years the island of Taveuni has been affected most.

The stick insect is said by Lever to feed on *Pandanus tectorius* and the reed *Miscanthus japonicus* as well as on coconut palms. It feeds at night, chewing large pieces out of the margins of leaflets. During the day it rests underneath the leaflets. Areas of one hundred acres or more may be severely defoliated during an outbreak. Some palms may be killed and others lose their crops and remain out of production for a long time. Infestations subside without spreading to large areas of adjacent palms.

The reasons for the rise and fall of populations of the stick insect are not known, though one factor which must influence the fluctuations is parasitism of the eggs. Two species of egg-parasites, *Paranstatus verticalis* Eady and *P. nigriscutellatus* Eady, of the family *Eupelmidae*, occur commonly in Fiji. These probably constitute the main factor controlling populations of the stick insect, but we do not know why such violent fluctuations occur. Dr. C. P. Hoyt has bred parasites from eggs of *Graeffea crouani* collected at Luganville, Espiritu Santo, New Hebrides, and these proved to be *P. verticalis*. Probably the egg-parasites have a much wider distribution than that which is now known.

The female stick insect drops its eggs freely, and most of them fall to the ground, while some lodge in the axils of the fronds. Incubation periods of eggs which have been kept under observation were 88 to 91 days (average 90) in the warm season and 97 to 114 days (average 100) in the cool season. The newly-hatched nymph climbs a palm and begins to feed on the young leaflets.

The male has five nymphal instars and the female six, a skin being cast between each instar. The period from hatching until the nymph becomes an adult has been found, during the cool season, to

* Senior Entomologist, Fiji Department of Agriculture.

Coconut palm in the sprayed area, severely defoliated by the stick insect.

The pilot tests the spraying device on the strip before carrying out the operation.

be from 87 to 101 days (average 92) for the male and from 106 to 113 days (average 111) for the female. During the warm season these periods would be shorter, probably averaging a little over 80 days for the male and about 100 days for the female.

After a female becomes adult, a period of about 20 days elapses before the first egg is laid. This period also would probably be a couple of days shorter in the warm season.

Longevity of adults in the cool season was from 161 to 173 days (average 167) for males and from 104 to 127 days (average 115) for females. Eggs are laid by the female throughout her adult life, the numbers laid by two females which were kept under observation being 106 and 131 (average 119).

The eggs are from 5 to 6 mm. long, between 2 and 3 mm. wide and about 2 mm. thick, being truncate at one end and pointed at the other. They are coarsely punctate, their colour varying from pinkish to grey to dark chocolate. (The best way to find eggs on the ground is to weed an area, remove the top inch of soil, and throw this into a vessel of water. The debris which floats is collected and very carefully searched on a white background.)

The nymphs hatch from the egg by pushing off the detachable pointed end They are green, and from 19 to 25 mm. long, i.e. about four times as long as the egg. They grow by regular casting of skins until they become adult. The male adult is about 60 mm. long and the female 100 mm. Their colour varies from green to grey, pinkish or brown. Their wings are very short, and useless for flight, those of the female being about 10 to 11 mm. long, and of the male 19 to 20 mm. long. When opened out, the hindwings are a beautiful rose colour.

Control Difficult In Fiji

Control of the stick insect has been a difficult problem in Fiji. On young palms, to which insecticide can be applied by a knapsack sprayer or a power duster, control is simple. However, most of the palms which have been severely attacked have been very tall, and have been growing in areas where wind is a problem. Some planters claim to have achieved control by lighting piles of dead fronds, rubbish, etc., sometimes with addition of sulphur, throughout the affected area on a still, hot day. The hot air causes the insects to fall to the ground. The writer has had no experience of this method, but greatly doubts its efficacy.

A power duster has been tried, but failed to give satisfactory cover of the fronds of tall palms. Stick bands round the trunks, with and without added insecticide, have also been tested. These caught large numbers of young nymphs, and some adults and older nymphs, but did not cope satisfactorily with an outbreak. The reason for their failure probably was that there were sufficient eggs in the axils of the fronds to keep the infestation going.

The only effective answer to the problem of applying insecticides to tall palms appeared to be the use of aircraft. However, this was not seriously considered, as it was thought that the cost per acre of spraying scattered and small areas would be prohibitive. In 1959 a local aircraft company fitted a Tiger Moth aircraft with a spraying outfit, and discussions revealed that spraying could be carried out at an economic cost.

Aerial Spraying Trial

It was decided that the Department of Agriculture should pay for a spraying trial on an experimental plot of 100 acres. A suitable area, where considerable damage was being done to old palms, was found in a plantation on the island of Taveuni. Laboratory tests had shown that B.H.C. and Dieldrin were toxic to the stick insect, D.D.T. being ineffective. B.H.C. was chosen for use in the trial, the objective being to apply it in oil solution at the rate of 4 oz. and 8 oz. of the gamma isomer in two gallons of diesoline per acre on two contiguous areas of 50 acres each. The plots were each about 60 chains long and 8½ chains wide.

The spraying outfit consisted of a tank to contain the insecticidal spray, which fed the fluid to a boom fitted to the trailing edge of the lower wing of the

The aircraft spraying above the palms.

aircraft. There were 24 nozzles spaced one foot apart along the boom. Pressure to force the liquid through the nozzles was provided by a wooden propeller, operated by air pressure. Preliminary trials showed that nozzle apertures of 1/32" would give about the desired output of spray fluid per minute when the aircraft flew at 60 miles per hour and treated one row of coconuts at a time.

Before spraying the trial plots, an estimate of the population of stick insects was made. Approximately one-third of the fronds of typical palms were cut and lowered to the ground, where they were placed on a tarpaulin and the insects on them were counted. The sample included a fair proportion of fronds of varying ages. From the counts made, the population of the whole palm was calculated. The estimated populations of five sample palms were 118, 124, 141, 168 and 206, the average being 147 (4 male and 2 female adults and 141 nymphs). The high proportion of nymphs to adults and of young nymphs to more mature ones showed that the population was increasing. By a misunderstanding, the population counts were made about six weeks before spraying was carried out. It is thought probable that, at the time of spraying, populations would have increased

The spray fluid was made up by adding the appropriate quantity of a B.H.C. solution containing 20% of the gamma isomer to drums of diesoline, after drawing off an equal quantity of oil, and rolling the drums back and forth to mix the fluids.

The first plot of 50 acres was sprayed between 2 p.m. and 3 p.m. and between 5 p.m. and 6 p.m. on May 18. There was rather too much wind, with the result that the aircraft had difficulty in maintaining its course, and had to fly somewhat higher than had been intended. At 3 a.m. the following morning rain began to fall, 20 points being recorded. The rate of application on this plot was supposed to be 8 oz. of the gamma isomer of B.H.C. in two gallons of spray fluid per acre. Actually 10 oz. of gamma isomer in 2½ gallons of spray fluid per acre was applied.

The second plot, of which the planned application rate was 4 oz. of the gamma isomer of B.H.C. in two gallons of spray fluid per acre, was treated on May 19, between 10 a.m. and 11.30 a.m. Here again there was too much wind, and the actual rate of application was 4.4 oz. of the gamma isomer of B.H.C. in 2.2 gallons of spray fluid per acre. During the afternoon, a few points of light rain fell between 3 p.m. and 5 p.m.

In both plots a quick knock-down of stick insects was obtained, the affected insects beginning to fall within an hour

Frond being lowered from crown of palm for count of stick insects.

of the time of spraying. They continued to fall, in diminishing numbers, during a period of three days after spraying. No newly-hatched nymphs were found on sprayed palms until the fourth day after spraying, indicating that the residual effect of the treatments lasted for three days. The lower rate of application appeared quite adequate to give a heavy mortality, and there was no advantage in using the higher rate.

When spraying had been completed, estimates of populations of stick insects were again made by counting those found on fronds cut from palms in the treated plots. The results of these counts are shown in the table below.

As the original populations were of the order of 150 or more per palm, a very high percentage of mortality is indicated.

In theory, a second spraying would be necessary to bring about a high degree of control. In practice this might not always be necessary, because the population of stick insects may sometimes be declining naturally at the time when the second treatment is due. The object of a second spraying is to kill the insects which have hatched from eggs dropped before the first spraying. It should be so timed that it is applied after all the eggs have hatched and before insects arising from the earliest hatchings have had time to mature and begin laying the next generation of eggs. A study of the life-history figures given above will show that this period is four months.

Costs Reasonable

Costs involved are reasonable, especially when copra prices are at a high level. The cost per acre of the B.H.C. and diesoline mixture at 2 gallons per acre and 4 ounces of the gamma isomer works out at about £stg.8/-. If the spray fluid were made up by dissolving 99% Lindane (the gamma isomer of B.H.C.) powder in diesoline, the cost would be about £stg.7/- per acre.

Cost of the aircraft would vary widely, according to the extent of the area to be treated, proximity of a landing strip, distance of the plantation from the aircraft's headquarters, type of aircraft used, etc. A sum of £stg.1/-/- per acre should cover most cases, so that total cost of insecticidal spray and application would be less than £stg.30/- per acre for one treatment.

PICTURE CREDITS

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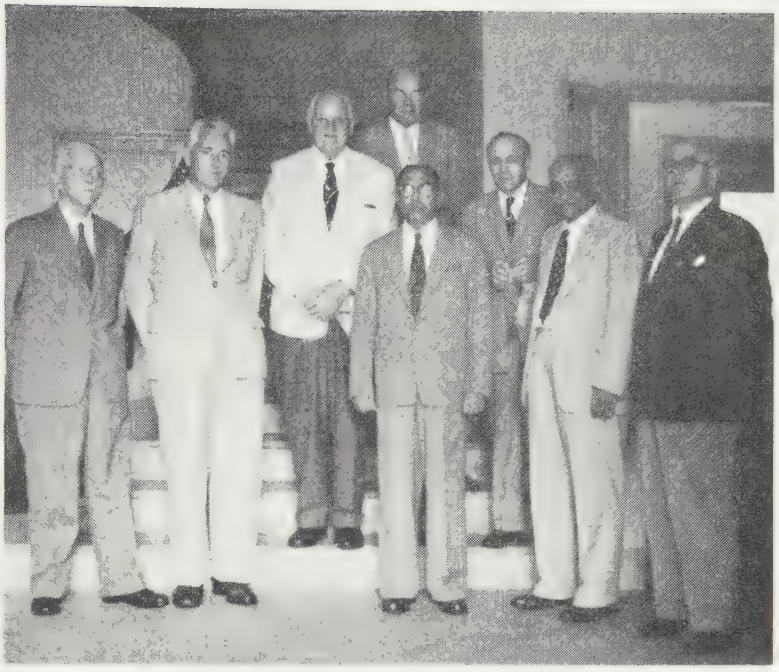
Estimated Populations Of Stick Insects In Treated Plots

Period After Spraying	10 oz. Plot		4.4 oz. Plot	
	Number Of Palms Sampled	*Calculated Population Per Palm*	*Number Of Palms Sampled*	*Calculated Population Per Palm*
1 day	2	91	2	24
2 days	2	31	1	Nil
3 days	2	22	1	12
4 days	1	10	—	—
9 days	2	5	2	Nil



Members of the Filariasis Study Group, with Commission officers who attended the meeting. Left to right: Dr. H. de Rook; Mr. T. R. Smith (Secretary-General, South Pacific Commission); Sir Philip Manson-Bahr; Dr. Willard H. Wright (at rear); Dr. N. V. Bhaduri; Dr. T. C. Lonie (Acting Executive Officer for Health, SPC); Dr. M. O. T. Iyengar (Mosquito-borne Diseases Specialist, SPC); Dr. T. C. Backhouse.

Filariasis Study Group Meets In Noumea

By T. C. LONIE*

UNDER the distinguished chairmanship of Sir Philip Manson-Bahr, doyen of international workers in this field, a small group of experts met in Nouméa to consider the work done in filariasis over the last few years in the South Pacific generally, but more particularly in relation to the share taken by the South Pacific Commission in research and in making available the latest knowledge of the means of prevention and control of this disease so prevalent in this area.

The meeting was held at Commission headquarters from November 16-20. Members of the Study Group who attended were:

SIR PHILIP MANSON-BAHR, M.D., F.R.C.P., formerly Director of the Clinical Division of the London School of Hygiene and Tropical Medicine, and Consultant to the Colonial Office and Crown Agents for the Colonies.

DR. T. C. BACKHOUSE, Senior Lecturer in Parasitology, School of Public Health and Tropical Medicine, Sydney, formerly Government Pathologist, Territory of New Guinea.

DR. N. V. BHADURI, formerly Head of the Department of Helminthology and Filariasis Research, School of Tropical Medicine, Calcutta, India.

DR. H. DE ROOK, Institute of Tropical Hygiene and Geographical Pathology, Amsterdam, Holland.

DR. WILLARD H. WRIGHT, Professional Associate, National Academy of Sciences, National Research Council, Washington, D.C., U.S.A.

Over Fifty Years Of Research

It is of interest to note that Sir Philip was engaged in investigating the disease some fifty years ago in Fiji, has studied it in many countries, and still maintains the most active interest in its cause, its manifestations, and in its treatment and control.

His revered father-in-law, the late Sir Patrick Manson, who has been called the Father of Tropical Medicine, was the first to discover as long ago as 1877 that the disease was carried by a mosquito.

Filariasis is the disease produced by a worm, Filaria or Wuchereria bancrofti, first discovered by a Dr. Bancroft in Brisbane, Australia, in 1876. The worm lives in the tissues, and by its action produces filarial fever and also the condition known so well in the Pacific as elephantiasis. Its embryos picked up by the biting mosquito in the blood of an infected person undergo changes in the mosquito, and in due course are transferred to uninfected persons by the mosquito in the act of biting.

A Complex Problem

But not all mosquitoes carry the filaria worm, and of those which do, not all occur in the same places, or have the same habits of breeding or of feeding. So the problem is a complex one and varies from place to place, even in the Pacific islands, and the Study Group had before it the most extensive records of investigation into these problems.

For over six years, the South Pacific Commission's expert in mosquito-borne diseases, Dr. M. O. T. Iyengar, has studied the local South Pacific problems, making many personal field observations in many areas, and advising administrations on what should be done in their particular country to prevent the spread of the disease.

In certain areas, especially Netherlands New Guinea, Fiji, and Tahiti, other investigators have been at work also, some of these studies having been sponsored or supported by the Commission. A vast literature has grown up, and this was placed in abstract and summary form before the Group.

Study Group's Main Tasks

The Commission in 1951 sponsored a large and representative Conference on Filariasis in Tahiti, and it was one of the tasks of the Study Group to consider the 56 recommendations of the Conference in the light of the work done since that time, and to decide how far the recommendations had been carried into effect, and what still remained to be completed.

This having been done, and other matters having come under review, it was the final task of the Group to consider whether, in its role of a consultative and advisory body to the governments and territories of the South Pacific, the Commission had completed its task in relation to filariasis.

Of course, work and research on this disease must continue to be carried out for a long time to come. However, it is clear that in several territories at least, this further work and research will, in the main, be carried out under local arrangements, and the Commission's assistance will not be needed. In others the advice of the Commission's expert has already been sought, and he has advised the governments concerned of the nature and extent of their filariasis pro-

* Executive Officer for Health (Acting), South Pacific Commission.

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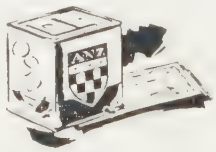

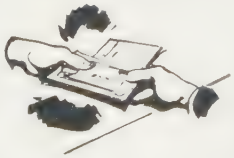

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blem, and has provided them with a proposed plan of control.

Whether the administrations concerned do in fact introduce the recommended controls is the business of the territories concerned. The Commission can only advise; it has not the means or the authority to carry out the control measures.

The Study Group gave careful consideration to what territories were doing for themselves, what assistance had been sought from the Commission, and the help that had been given. Finally, it considered what further requests for assistance were likely to be made from the Commission, and whether in volume or importance they would justify the maintenance of the project for a further period.

Having considered these aspects, the Study Group has made recommendations which will be considered by the Commission's Research Council in July, and subsequently by the Commission itself at its session in October.

Upon one matter the Study Group members were of unanimous emphatic opinion. The work done by the Commission in direct research and investigation of filariasis by the Commission's own expert, Dr. M. O. T. Iyengar has added very considerably to the knowledge of the disease, and must be regarded as of permanent and outstanding value, not only in the South Pacific but in all the many other places in the world where filariasis occurs.

New Medical School For Port Moresby

A medical school for the training of indigenous nurses and medical assistants is to be erected at Port Moresby this year. Initially the school will provide accommodation and training for one hundred nurses. Eventually it will have 600 students.

The Administration now maintains some 1,500 hospitals and medical centres, ranging from the recently-completed £1 million hospital at Port Moresby to remote village aid posts. In addition, about 550 hospitals and aid posts are maintained by missions with Government aid.

Rubber Growing In Papua And New Guinea

High-yielding rubber planting material is being successfully developed in Papua and New Guinea. At the Administration's rubber experiment station at Bisianumu, near Port Moresby, a collection has been built up of the world's best rubber types. Budwood from them now being used in budding and grafting operations on rubber plantations will greatly increase yield.

The Administration will investigate and encourage the growing of rubber by native small-holders in the south-coastal areas of Papua.

Marketing in its simplest form. Villagers display their produce at the Koki Market, Port Moresby. Although the Administration provides market buildings, many vendors prefer to follow the village custom of displaying their wares in the shade of a coconut palm.

Marketing Guides From FAO

FAO MARKETING GUIDES NOS. 1 AND 2 *are the first two of a new series of publications being issued by the Food and Agriculture Organization. They are reviewed below by . . .*

R. H. BOYAN*

THIS new series of handbooks is designed to meet the general demand for information on methods of improving the handling of agricultural products between the producer and consumer, of avoiding wastage and reducing costs.

Guide No. 1, entitled *Marketing Problems and Improvement Programs,* deals with organization and problems of marketing irrespective of product while Guide No. 2, entitled *Marketing Fruit and Vegetables,* is the first of a series dealing with specific products. Both would serve as useful reference books where a review of marketing facilities and organization is intended or where new marketing developments are in prospect. A wide range of matters is dealt with at the practical level; for example, reference is made to recent successful experiments in the canning of bananas, to the need for road surfaces which will allow the operation of heavy trucks, and to the value of the radio in the dissemination of market information.

Guide No. 1—Marketing Problems And Improvement Programs

The first part of Guide No. 1 describes the variety of relationships that comprise the marketing pattern of a country. Then follows a critical examination of a wide range of marketing problems, accompanied by suggestions for overcoming those problems. Actual measures taken in various countries are quoted. Further possible solutions are analysed in relation to the various types of organization which may be used in the implementation of the remedial measures. Consideration is given both to private enterprise (including individuals, corporations and co-operatives) and to government activities, either in the form of Boards or the direct action of Government Departments. The advantages and defects of alternative methods are carefully set down, and recommendations and preferences are indicated only rarely.

At various points the text indicates a preference for healthy competition. But recognition is given to the possibilities of monopolies or of collaboration between groups of distributors, and the need in such circumstances for government intervention. The Guide states that such intervention "could include removal of barriers to the entry of new firms, and where justified, the organization of competing enterprises under co-operative or state management."

In addition, favourable mention is made of the metric system for weights and measures, of integration of credit and marketing through co-operatives where credit is needed pending the sale of a crop, and of a wider extension of the Warehouse Receipt System involving, possibly, a large-scale warehouse construction scheme. However, consistent with the remainder of the Guide, such favourable mention is qualified by an analysis of the limitations and defects of each of these proposals.

Stabilization policies are the subject of considerable comment, and a warning is given in the following words:— "The danger that resources will not move in accordance with the changing demands of society is inherent in stabilization schemes; relaxation at intervals to permit adaptation to changed patterns of technique and demand is of paramount importance."

Although considerable attention is given to outlining situations and circumstances where government intervention is desirable, preference for private activities in normal circumstances is indicated, and adverse comment is made on such matters as misuse of licensing powers and obstructive taxes. In addition, emphasis is placed on the advantages of a voluntary grading system over one controlled by government.

Guide No. 2—Marketing Fruit And Vegetables

To some extent the content of Guide No. 2 follows that of Guide No. 1, but concentration on the particular subject of fruit and vegetables enables a more detailed analysis of problems and improvement programmes. The Guide is stated as having been prepared on the basis of advice submitted by a team of experts in the Netherlands.

Examples of practical action are taken from various parts of the world, but more detailed information is given in connection with the farmers' assembly markets in the Netherlands and the Hong Kong Vegetable Marketing Scheme The latter is controlled by the Vegetable Marketing Organization, the main functions of which are the collection and transport of vegetables from collecting points on the mainland to the wholesale

* Co-operatives Officer, South Pacific Commission.

market in Kowloon, and the supervision of all sales and financial transactions.

In Guide No. 2 the analytical approach is carried on, and early in the text the warning is given that marketing improvement programmes should take account of the economic and social environment; piece-by-piece re-organization is recommended. It is also pointed out that the perishable and heterogeneous nature of fruit and vegetables calls for diversity in sales methods and the need for competition.

Matters which are discussed at length are packing, transport and storage, standardization, wholesale markets and local assembly markets and auction systems. There is much practicable advice and reference to concrete examples.

Other general matters which are treated analytically are the setting-up of an export market or processing plants, the disposal of surpluses, the possible role of trade associations, co-operatives and marketing boards, ways in which the grower can influence prices by action at the production level, contribution to efficiency that can be made by revisions of the credit policy, and the value of an advisory service for growers.

Both Guides contain references to the assistance that may be obtained from FAO in connection with problems and programmes. Guide No. 1 groups such assistance under four headings:

(i) The provision of a marketing specialist to work for some time in a particular country.
(ii) Marketing meetings and training courses.
(iii) Marketing fellowships.
(iv) Marketing information and advice from FAO headquarters.

Both volumes are liberally illustrated. Tables and graphs are few. Among those of particular interest are breakdowns of retail prices showing the proportions received by the various factors in the distribution process. Additional figures are given in the text.

Both Guides contain a series of Appendices ranging from such matters as the temperature to be maintained during the transport of various fruits and vegetables to a project outline for a study of internal rice marketing in Indonesia and the All-India Standard Contract for Groundnuts.

New Bibliography Of Pacific Languages

An Annotated Bibliography Of The Languages Of The Gilbert Islands, Ellice Islands, And Nauru. E. F. Kunz, Public Library of New South Wales, Sydney. 1959.

This 202-page roneoed work is a very interesting and timely production. As the title makes clear, it lists all known publications in the languages of the three groups of islands mentioned. Some of these are in the Mitchell Library, where the Pacific Island books are under the charge of Dr. Kunz, but a long list of other libraries and private collections have been drawn on as well.

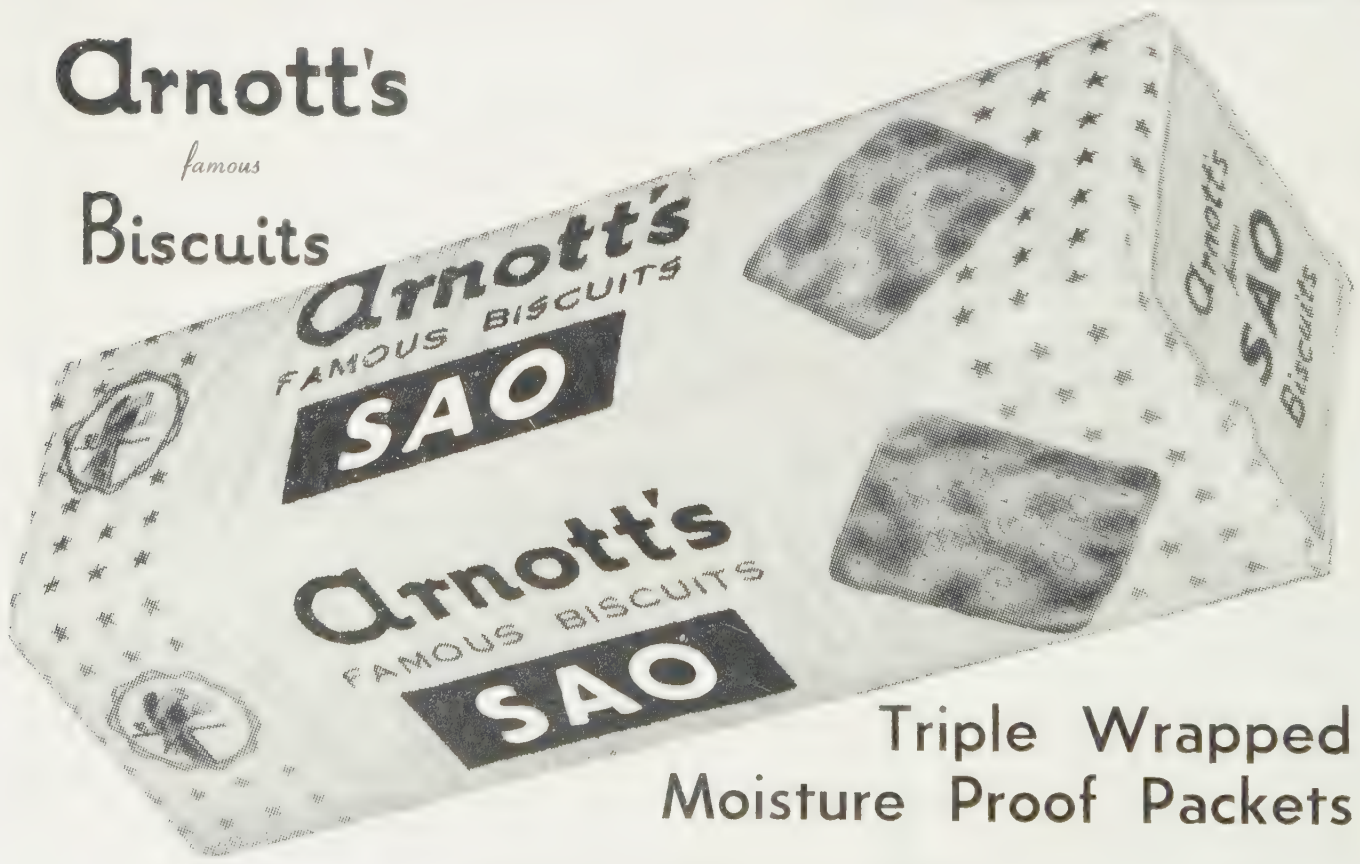
An introduction by Mr. Justice J. A. Ferguson provides the background to each of the island groups. In addition to a full collation of all the printed materials available in these languages, subject lists and edition tables are given along with biographical notes concerning the authors and translators.

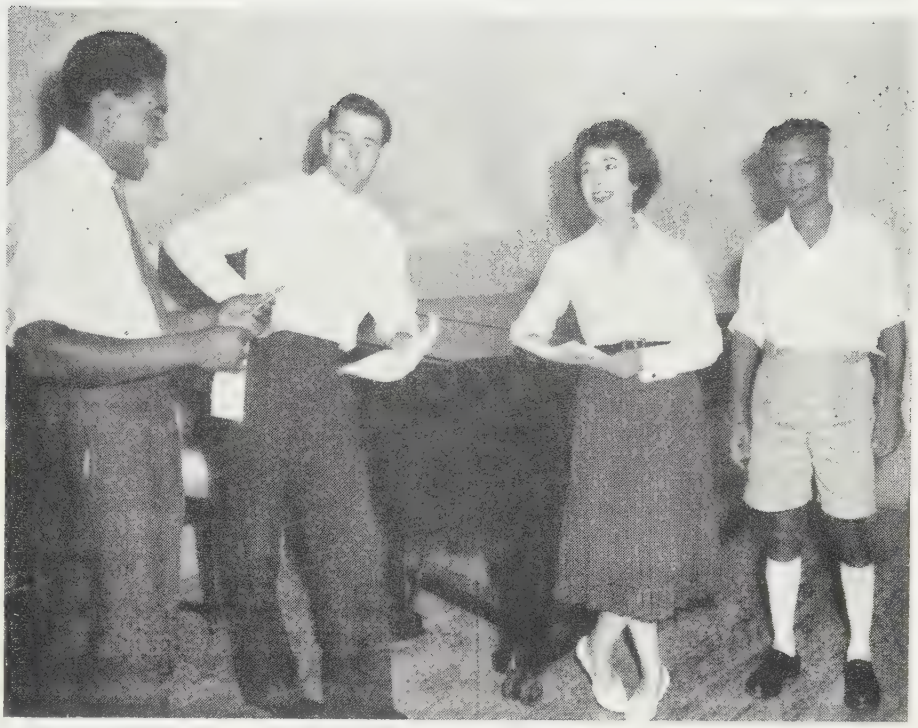
The cataloguing of Ellice Island material is of particular interest because this language is only of recent years coming into its own. Previously, Samoan was the only language used in mission work and publications for the Ellice Islands.

The Nauruan section is of interest for the very opposite reason: English language and literature seem more than likely to replace vernacular literature in Nauru, and it looks as though this language will within measurable time become hardly more than a museum specimen.

This book should be in all libraries dealing with Pacific affairs, and in the possession of all who are interested in them.

A. CAPELL.





Stars of the "English For You" programme now being broadcast over Suva Radio twice weekly. From left to right: Epeli Cagimaiwai, Laurie Rolls, June Knox-Mawyer, V. Sudhakar.

"English For You"

English lessons are now being broadcast regularly in Fiji as part of a campaign to improve the standard of English in the Colony. Two lessons a week are being broadcast for Fijian listeners and two for Indian, with a repeat broadcast of each lesson at the weekend. There will be 150 broadcasts in the series.

By GEORGE BEZAR

A REMARKABLE example of complete co-operation is being demonstrated in Fiji today. Participants are the British Broadcasting Corporation on one side of the world, and on the other the Government of Fiji, the Education Department, the Fiji Broadcasting Commission, and of course the Fijian, Indian, Chinese and part-European people of the Colony.

It is all part of a Colony-wide scheme to teach English by radio. The Course as originally planned will take about 18 months.

To instance the necessity for an educational plan of this nature, one need only take the observation of the Director of Education in Fiji, the Hon. J. G. Rodger, when addressing Indian teachers at Ba. Of 563 children who sat for secondary schools entrance examinations at Nadi, Lautoka and Ba centres last year, only 65 achieved half marks or more. Mr. Rodger pointed out that the examination was no more than "a very simple test in English, arithmetic and general knowledge."

That something had to be done about this situation was obvious, and the plan now in operation has much to commend it. Detail of the broadcasts has not been easy to arrange; but from reports already received it is certain that in a very few months the numbers of men, women and children in the Colony who will be able to speak at least a conversational English will have increased enormously.

Need For Campaign

In a four-station broadcast to launch the "English For You" campaign, His Excellency the Governor of Fiji, Sir Kenneth Maddocks, said that when visiting homes, hospitals, villages, places of business, schools and factories, he had been struck by the fact that so few people understood English, the official language of the Colony and of most of the Commonwealth; a language much used throughout the world. If Fiji was to continue to develop in peace and friendliness, it was essential that its different peoples should understand each other. "Without a common language," said His Excellency, "this would be difficult."

One of the platforms of this admirable scheme is to "make your listening a family affair". Probably the principal reason that so many children of preschool age do not speak any English at all is that it is not spoken in the home; at any rate not sufficiently, or well enough, for the small child to understand

The whole idea is ambitious; but in a Colony like Fiji it is almost essential to speak or to understand English. The urgency will increase.

Many of the population are bi-lingual; a sizeable number are tri-lingual. In one transaction it is possible to hear Fijian, Hindustani, Chinese and English being spoken by the one person. It is not common, but at the same time it is not such a rarity as one would imagine. Years ago there did not seem to be the same need for people to speak other than their own native tongue; but with the advance of culture, the widening of commercial trading and the extraordinary forward leap of the professions in the Islands, the need is increasing by leaps and bounds. In turn, tourists are an influence on the language question.

Simplicity A Basic Factor

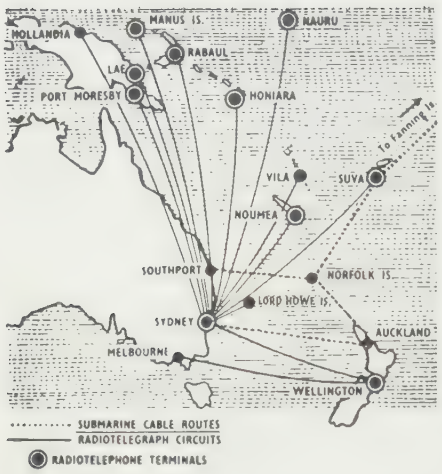
The actual mechanics of the broadcasting of English lessons are simple, yet the sinking of the early foundations was a monumental task. Designed primarily for those who have no knowledge of English and those who have a knowledge and wish to improve, the sessions go on the air twice weekly. Local influences have been woven into the B.B.C. scripts, and broadcasters and writers have all had a hand in the finished material.

In the Fijian programme there is a Fijian teacher; in the Hindustani, an Indian. They are associated in the broadcast with English-speaking "John" and "Mary".

Simplicity is a basic factor in the entire scheme. The lessons are presented in such a way that even without any previous knowledge of the language, a listener can begin to understand immediately.

As the lessons progress, so will the listener be able to cope with more and bigger words, phrases, sentences, complete items. Mixed speech will follow, and although the aim is to reach a high level as quickly as possible, it will never reach a stage where the learning of English will be difficult.

Let us examine the pattern of an early lesson. Even in the introduction one finds a learning process. When the



LINKING . . .

the SOUTH PACIFIC

. . . to the WORLD

O.T.C. officers maintain the overseas radio stations at Port Moresby, Rabaul and Lae, and the submarine cable stations at Norfolk Island, Suva and Fanning Island.

Throughout Australia, O.T.C. provides international radiotelegraph and radiotelephone services for the South Pacific area.

THE OVERSEAS TELECOMMUNICATIONS COMMISSION (AUSTRALIA)

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announcer presents the title, "English For You", it is repeated in the vernacular. The listener is warned, for example, that John is going to speak about his hands. So John says: "This is my hand." It is repeated. Likewise: "These are my hands." And the teacher explains the difference and highlights the distinction between the words "this" and "these"—and the plural meaning.

At the end of this particular lesson the teacher remarks that he will speak about those listening. He tells them that "they" are his listeners. This is repeated, and so on. The session is broadcast slowly and clearly, and is designed to have an entertainment appeal as well as educational value.

Programme Timing A Problem

Some difficulty was experienced by the F.B.C. in endeavouring to broadcast the "English For You" lessons to the greatest number of listeners whose need for them was most urgent. It can be realized that certain times suit some people, but not others.

Many officials were consulted, as well as representatives of all races, villagers and townspeople. In various localities the planners met and spoke with all sections of the community. Times were agreed upon, and the session is now broadcast at 2.00 o'clock on Mondays and Wednesdays in Fijian, and on Tuesdays and Thursdays in Hindustani. The broadcasts are repeated on Saturdays at 1.00 o'clock in Hindustani and 5.00 o'clock in Fijian. This programme timing appears to have proved acceptable to the majority.

To Improve General Welfare

One of the first objectives in this bid to spread a wider knowledge of English is to help the masses. Rightly, the starting point must be the children. As the Chairman of the Fiji Broadcasting Commission, Mr. Robert L. Munro, said when introducing the "English For You" lessons: "The main purpose is to increase the general welfare of the peoples of the Colony—to make Fiji a happier and more enlightened community." He spoke of the advantages to Fiji of English being a common language.

The many advocates who discussed the application of the scheme to Fiji realized the helplessness of children knowing English (and a little of their own language) and not being able to find anyone at home to speak it. So a further aim of the Course is to foster a desire among the parents to understand it.

It will not be easy; but the co-operation the F.B.C. has found already has been encouraging. If father and mother, sisters and brothers listen to the radio lessons and the child learns English at school, obviously there must be a closer companionship in the home. This progresses far afield and the knowledge gained in the schools and from the radio must find its level in a generally higher standard of education later on, and an appreciation of the value of English in everyday life.

Community Listening Common

In places like Fiji it is not always possible for every inhabitant to own a radio. Therefore much community listening is practised.

The value of community listening is inestimable. It is simple to realize how members of a group can learn, by subsequent discussion, more quickly and more thoroughly than an individual can.

If there could be any question as to the necessity of a "school" of the "English For You" type, then the figures of examination passes given at the beginning of this article provide a conclusive answer.

When Mr. Rodger outlined the salient points of the idea he emphasized one significant factor in connexion with English instruction in schools. He explained that English is taught in Classes 1, 2, 3 and 4 in all Indian, Fijian and Chinese schools; but not until Class 5 are the lessons taught *in* English. The Government has endeavoured to start teaching at an earlier age, but progress has been slow. Mr. Rodger instanced his own case. He said: "When I left primary school at the age of 13, I am quite sure that French (the only foreign language I had been taught at that stage) was my weakest subject—and don't forget that to Indians and Fijians English *is* a foreign language."

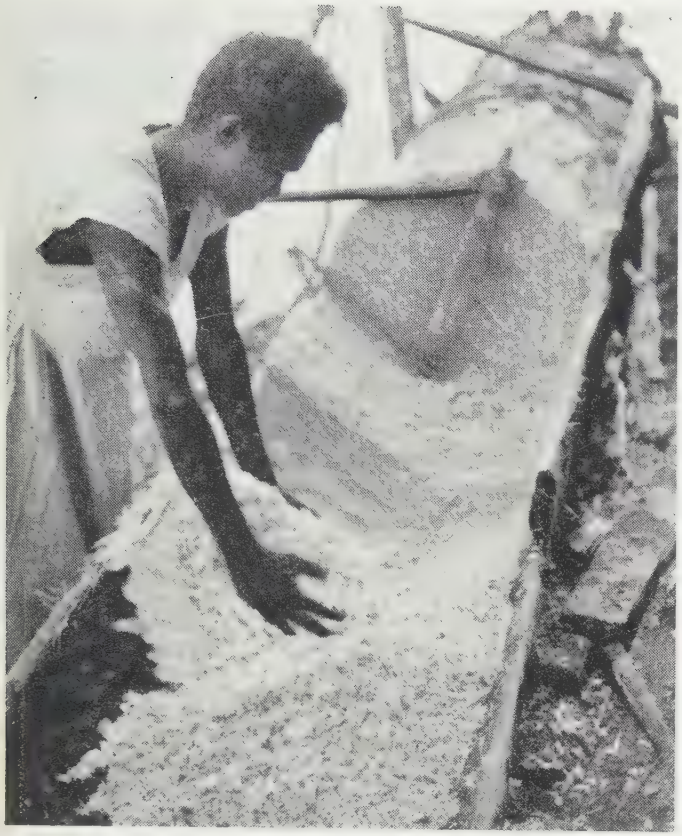
Course Costs Surprisingly Low

No one will deny that education anywhere is costly; yet this gigantic effort of the Fiji Broadcasting Commission and the educational authorities is surprisingly easy on available funds. The increase in the Government's Education Bill in 1958 as compared with 1946 makes staggering reading: an increase of over 660 per cent. Under £150,000 twelve years ago, over £1,000,000 last year. Increases of this nature are understandable and are expected; but the costs of "English For You" are negligible by comparison with those of other processes of education.

For example, to help cover costs of "tape" for recordings (obviously broadcasts must be pre-recorded) the Standing Committee on Finance has approved the expenditure of £275. The series over the 18 months will call for at least 150 broadcasts of 15-minute lessons, and tapes cost about 26/-.

* * *

"English For You" has been successful in a number of African territories. There seems no reason why it should not be a permanent asset to the people of the three hundred or so islands that comprise the Fiji Group.



Sago-making in western Papua on the banks of the Oriomo River. Here the pith has been grated and crushed with the adze-like implement shown in the trough, resting against the pith.

Here the crushed pith is being washed in an inclined trough made from a leaf of the sago palm. The liquid containing the starch is collected in draining pans, also made from portions of the palm.

Below is shown the finished product, which is wrapped in palm leaves to preserve it.

Sago Making In Swamplands Of Western Papua

SAGO is one of the staple foods of the people living in the swamp and delta regions of Papua and New Guinea. It is a starch extracted from the stem of the *Metroxylon* palm, which is particularly abundant in swampy lowlands. They are sometimes planted but, more frequently, natural stands of sago palms are exploited.

The accompanying photographs are of sago-making on the banks of the Oriomo River in western Papua. The process is described in detail in *Food Plants Of The South Sea Islands,* by Emile Massal and Jacques Barrau (SPC Technical Paper No. 94).

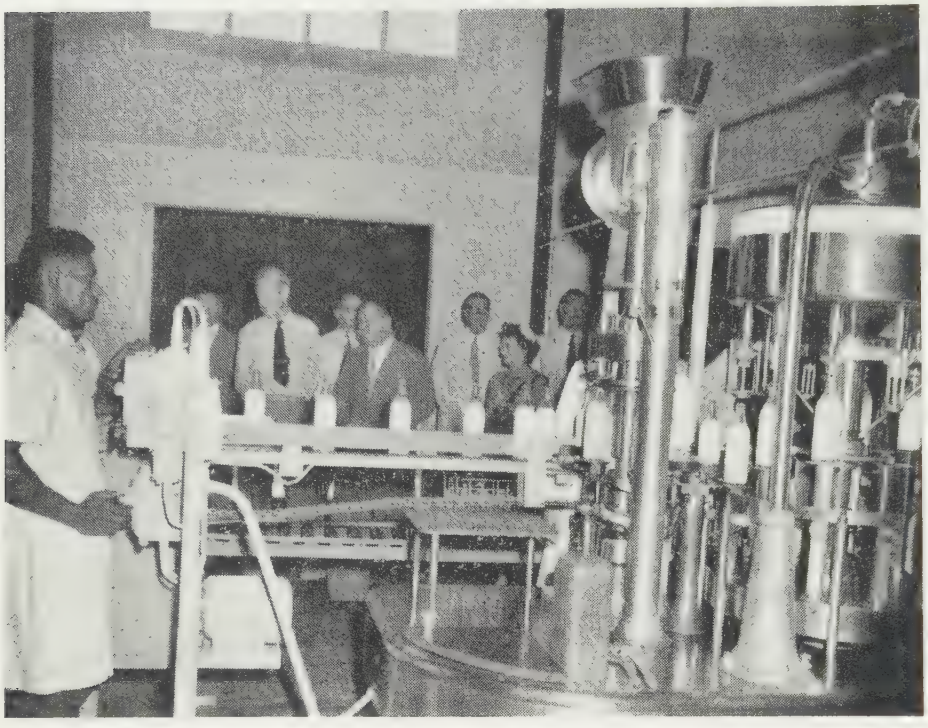
After felling, the bark is removed from half of the sago trunk. The pith is removed by grating and crushing with a kind of adze of which the cutting section is made of rough stone, hard wood, or, more often, from a piece of sharpened bamboo. Today, where there is contact with Europeans, a section of metal piping with sharpened edges is a frequent substitute for the wooden or stone tool.

The crushed pith is washed in an inclined trough, made from a leaf of the sago palm. This process is accompanied by threshing with a lath or kneading by hand. The liquid containing the starch runs into the trough and filters through a fibrous spathe arranged for this purpose. It is collected in draining pans made from portions of the palm (leaves, leaf stalks, etc.).

The drained sago is then partially dried. To preserve it, it is wrapped in bundles in palm leaves. These bundles, while most often cylindrical or conical, vary in form. If the sago is intended for family consumption only, they are more or

(Continued on page 62)

Milk and Milk Products In Human Nutrition



Bottling plant of the newly-opened Rewa Dairy Company in Suva, Fiji. This photograph, taken on the opening day, shows sterilized milk being automatically bottled and capped. Modern milk-processing plants such as this are rare in the South Pacific, where climate and lack of developed pasture often does not favour the development of a dairying industry. An adequate supply of milk in powdered and other processed forms is thus an urgent need in many territories.

Of special interest to all concerned with the production, distribution and human consumption of milk and milk products is the survey with the above title published recently by the Food and Agriculture Organization of the United Nations. It is reviewed below by . . .

T. C. LONIE*

HERE is a most excellent résumé of the current knowledge of milk and milk products—what milk is and what is its nutritive value; how it is prepared and processed, and what are its products from butter, cheese and ice cream at the sophisticated end of the scale to dried reindeer's milk and other traditional products used among primitive peoples; and finally a discussion of its place in the national diets of the highly-developed countries on the one hand to those with marked dietary poverty on the other.

The well-known name of its author, Dr. S. K. Kon of the National Institute of Dairying in Reading, England, and the imprimatur of FAO guarantee its reliability as a source of information.

Milk of course has been a major item of diet since earliest times in pastoral countries. Very early in the book of Genesis it is mentioned with butter and freshly-killed veal as items in a meal prepared by Abram for distinguished (and heavenly) visitors, and it is still a staple item in the diet of nomadic East African pastoral peoples. But in low-lying tropical countries generally, and in the Pacific Islands in particular, it has figured very often not at all; and in these places fish or animal and vegetable products have provided the protein, fat and vitamins necessary for life and health. Where these have been plentiful, and where perhaps demands on time and energy for productive work have been fitful and also modest, eating and living habits have conformed to a degree which made milk and milk products on the whole unnecessary to healthy living.

But this has been at a cost only now becoming apparent. Deprived of breast milk by death or disease—or sometimes custom—it has been difficult for the infant to survive in the early months, and at the weaning period particularly, the physiological strain of adapting to a largely-vegetable diet has often been more than the young child could stand, and death or disease subsequent on malnutrition at this time has accounted for high infant mortality, and in the survivors, failure of growth and susceptibility to disease. These feeding hazards which lower resistance to disease are undoubtedly the major basic causes of the high loss of young life in underdeveloped countries.

Furthermore, in spite of this loss of life due to these causes, the general rise in standards of living, the absence of disastrous wars, the improving standards of medical care and the control of epidemic disease, have all resulted in large increases of population. This in turn has made the naturally-available local sources of food insufficient. Besides all this there have been inevitable changes in the way of life which have not always made child nurture easier.

It has become obvious, therefore, that there is need both in children and adults for easily assimilable foods of high physiological value to counter all these adverse factors.

Milk and milk products are an obvious answer to the need, providing appropriate surpluses exist in milk-producing countries, and providing they can be made available at the points of greatest need, at prices and in a form which are adequate.

While butter and cheese are always relatively expensive, and demand for them in the richer countries is high, it is perhaps fortunate that the skim milk which is a waste product of butter-making contains most of the milk protein, for it is precisely this element of the diet which is conspiciously lacking in countries where the people are under — or badly — fed. Furthermore, dried skim milk keeps better than dried whole milk, and is thus a more marketable product. And because it is in many countries really a waste product, skim milk in all its forms is cheap milk.

It is a fantastic state of affairs that—as the book under review points out—"As yet only a fraction of the skim milk and buttermilk from butter-making is saved by drying, and still less of it, liquid or dry, used directly by man."

The author refers to the fact that in Australia and New Zealand, each producing around 5 million tons of milk a year of which about 70 per cent is used for butter-making, only some 10 per cent of the resultant skim milk is dried, and

* Public Health Officer, South Pacific Commission.

part of the rest is used for feeding stock. As is generally known, a very large amount is simply wasted.

In 1957 the United Kingdom threw away no less than 12 million gallons of skim milk, equivalent to over four and a quarter million pounds of milk protein.

On the other hand, the United States of America, using about twelve and a half million tons of milk for butter-making, dries or condenses nearly 60 per cent of the resulting skim milk, and uses a further 8 per cent to make cottage cheese. And as Dr. Kon reminds us: "It is mostly from the large surpluses of dried skim milk in the United States that the international milk distribution schemes have derived their supplies."

Yet in money aid to under-developed countries, the three British Commonwealth countries mentioned give largely and generously, and some at least of this money must be used on assisting the provision of necessary foods for undeveloped countries. Would it not be more economical—and certainly sensible — to use some of this money to set up milk-drying plants to supply food-hungry countries freely and cheaply with this valuable protein food, which all nutritionists agree is in such short supply in so many of them?

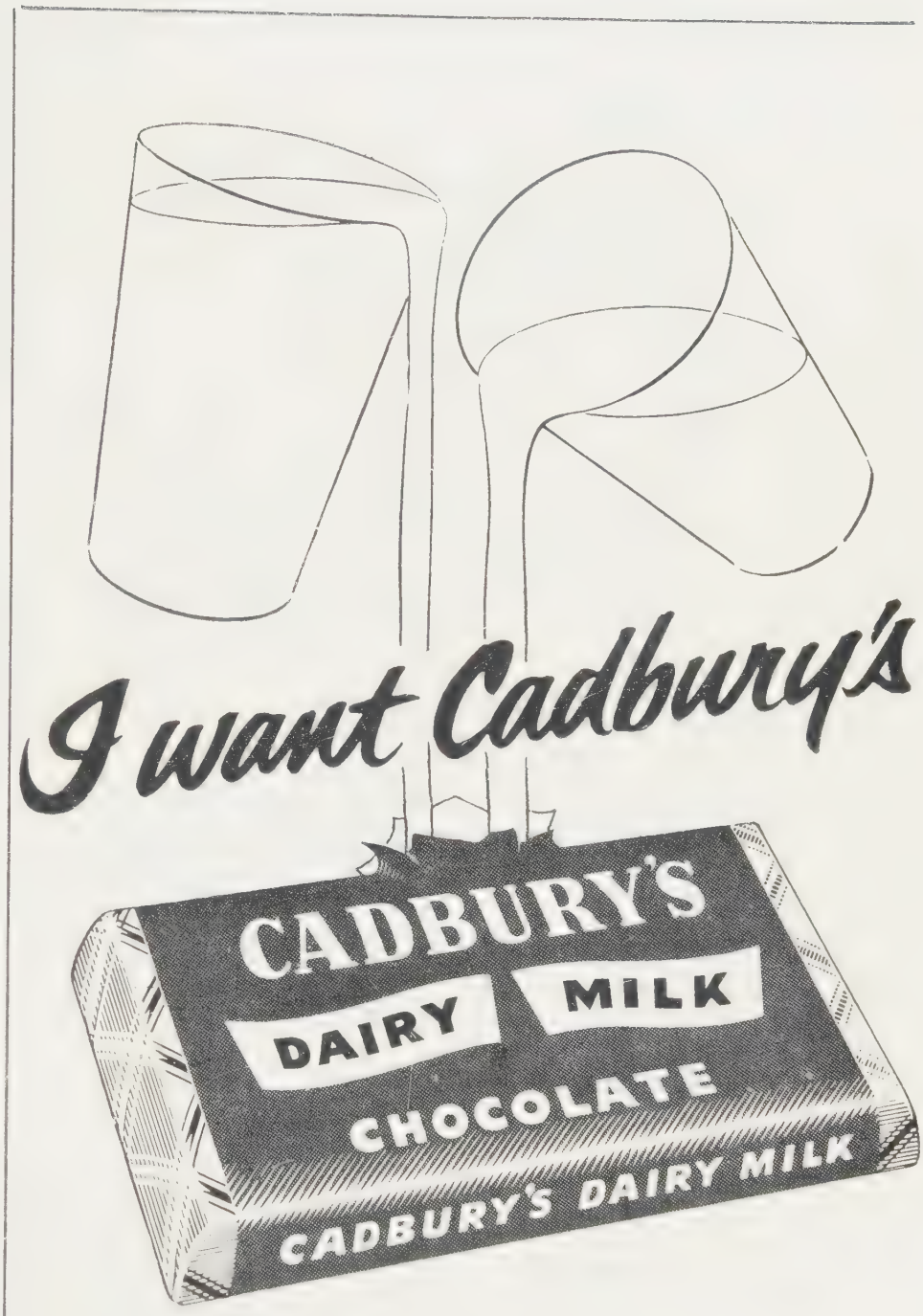
The diverting of surplus stocks of grain is a well-developed feature of famine relief. Why should it be largely left to the United States to do the same thing for the much more useful and valuable dried milk? Of course there are difficulties in arranging these things, but they are surely not insuperable.

Dr. Kon gives some illuminating figures about milk consumption per year. "In the United States of America and Canada, the consumption is similar to that in Western Europe, about 240kg. In New Zealand, the consumption reaches the high figure of 270kg. and is about 180kg. in Australia."

"Of countries for which information is available the lowest intakes are found in the Far East, for example 10kg. or less in Japan, and the Philippines, but they rise to 45kg. in India, and 80kg. in Pakistan."

It is true that such comparisons do not tell the whole story. Milk is not the only source of food in any country. But it is a good indicator of the relative intakes of the more nutritionally-valuable foods. And a state of near-starvation such as too often exists in the backward places of the earth, gives a wonderful edge to the appetite and does not dispose to over-fastidiousness in eating.

And lest we assume too lightly that food shortages comparable to those existing among the vast populations of Asia have no relevance in relation to the Pacific, let us not forget that some of the lowest per capita intakes of protein ever recorded have been observed



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in certain parts of New Guinea, and perhaps occur—though as yet uninvestigated—in other areas in the South Pacific, particularly in parts of Melanesia, and are problems of material importance to the administrations concerned.

It has always seemed to the writer that in the preparation of dried-milk products, very little imagination has been shown. Dried milk as such is a somewhat flavourless article of diet. Dried whole milk is more attractive than dried skim milk, but does not keep so well. Much too much reliance has been placed, in sophisticated countries especially, on the flavouring of milk with chocolate or fruit juices, or malts. The idea is to make the milk more attractive as a beverage, especially for children. But whatever the success of this manoeuvre among the usually already well-fed and often over-fed groups to which it is directed, it has really little relevance to the major issue of the use of milk as a necessary food for populations generally.

Traditionally, the souring of milk in one way or another and the concentration of the product in liquid or solid form has been practised in all milk-producing or stock breeding countries. A large variety of such preparations are listed and described by Dr. Kon. Such preparations have, however, only limited keeping qualities, less in hot than in cold countries, and except in the case of cheeses are of no commercial significance. All of them have flavours of indisputable milk or floury origin. They would be more acceptable, one feels, if they might have incorporated in them some definite meat or vegetable flavouring, if possible in some variety. They might then be acceptable in their own right as a satisfying form of meal.

Fish and meat — tinned or otherwise preserved — is always in demand, and even those on low cash incomes will go to some lengths to obtain them. Yet pound for pound it would seem that milk is the better food, and a larger source of protein than either meat or fish. Moreover, its preparation in marketable form poses no greater problems than those encountered in the fish and meat canning industry, and the resulting product, especially dried skim milk stored under proper conditions, has sufficiently long life for all practical purposes. In addition, dried skim milk, or indeed any dried milk, can easily be fortified by necessary food elements whose natural content in milk is low. There is need, however, to establish dried milk products as a more basic and ordinary item in the diets of those whose available protein supplies are too low.

One method of doing this would be to subsidise a satisfactory product for sale through ordinary commercial channels until such time as established demand

could be relied upon to maintain supplies. We may reasonably hope that better feeding and nutrition would materially assist in increased physical capacity, increased productivity and income, and that the consequent rise in living standards would produce a self-supporting community in the nutritional as well as the economic sense.

Child Feeding Programmes

Dr. Kon devotes ten pages of his book to the consideration of the use of milk and milk products in child feeding programmes. It is of course well known that UNICEF (United Nations Children's Fund) and the Food and Agriculture Organisation, together with the World Health Organisation, have, for the last twelve years, been engaged in assisting such schemes in underdeveloped and needy countries.

This has involved the distribution of milk already processed to the tune of 30,000 tons a year, but, as is reported here, FAO and UNICEF have also assisted in the development of organized dairying by the installation of processing plants in areas having milk production and marketing facilities capable of organization and expansion. This is a far-sighted project of great potential, and is worthy of every encouragement and support, especially as some of the plants at least are in areas of great nutritional need. It is a condition for the installation of such plants that a considerable part of the product must go to child feeding programmes in the country concerned.

There is no doubt of the value of these programmes which supply milk through government agencies not only to schools but through child welfare centres to children below school age. They do an immense amount of good in the prevention of malnutrition at a most vulnerable stage of life and growth.

But they cannot deal with adult malnutrition or with the very many children who have no school or child welfare centres to attend, or who for one reason or another do not attend them where they exist.

It is necessary that the diet in the home be improved in some way or another. The introduction of milk in acceptable form to the general food pattern in the underprivileged countries is at least part of the answer.

The book *Milk and Milk Products in Human Nutrition* should be widely read by all who have an interest not only in nutritional problems, but in the production, supply and sale of milk.

FOOTNOTE: For a racy and fascinating account of UNICEF activities, including milk-feeding schemes as they look on the spot, read *Half The World's Children* by that modern knight errant, Sam Keeny, the remarkable and indefatigable Director of the Asia Office of UNICEF. It is understood that the profits from the sale of the book go to support UNICEF work.

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Salt Tolerance Of Bamboos

By . . . W. F. STRAATMANS

Bambusa vulgaris. The green and yellow-stemmed varieties found in Tonga both belong to this species.

THE importance of the fact that certain varieties of bamboo are salt tolerant was recently brought to the attention of *Bulletin* readers by Dr. McClure[1]. It is interesting to note that Dr. Yuncher[2], in his new book on Tongan plants, mentions two varieties known in Tonga as the "green-stemmed bamboo" and the "yellow-stemmed bamboo", both belonging to the same species *Bambusa vulgaris* Schrader. It is very likely that the names "blue" and "green" bamboo are used locally for the same variety with the bluish-green stem.

As regards salt tolerance of bamboos, it should be pointed out that this property is made up of two different characteristics, "straight" tolerance to salinity of ground water, and tolerance to fluctuations in ground-water level. On saline flats and coastal lowlands, tidal water movement is reflected in periodic fluctuations in ground-water level. High tide will cause pressure of the outside water body of the sea on the fresh-water reservoir accumulated inland. Low tide, on the other hand, releases this pressure.

Apart from the fluctuations in ground-water level, the periodic pressure causes variations in salinity of the ground-water. The periodicity of the fluctuations does not coincide with the tidal rhythm of the sea but is subject to a "lag". This lag depends on a number of factors such as soil type, distance from the shore, elevation, type of fresh-water body.

"Straight" salinity tolerance of bamboos can often be judged by the colour and the appearance of the leaves. Salt damage may cause yellow discolouration and spirally-wound leaves.

Tolerance to fluctuations in ground-water level and concomitant variations in salinity may be shown in the rooting system being deeper and firmer as compared to non-tolerant varieties. For this reason early growth may seem satisfactory from the "straight" salinity point of view, but as the culms grow taller the shallow-rooted plants, which are non-tolerant in the other sense, will be blown over by strong winds.

Among other things, these two aspects of salinity tolerance of bamboos require detailed investigation.

Finally, it may be useful to mention that Huberman[3] recently published an interesting article on the methods of cultivation of bamboos actually applied in Asia. Much of what the author has explained on this subject is also of immediate importance in the study of bamboos for the Pacific.

[1] McClure, F. A. (1959). *Need for Bamboos Tolerant of Salinity. SPC Quarterly Bulletin*, July 1959.
[2] Yuncker, T. G. (1959). *Plants of Tonga.* Bernice P. Bishop Museum Bulletin 208.
[3] Huberman, M. A. (1959). *La sylviculture du bamboo.* Unasylva. Vol. 8 (1), pp. 37-44.

Big-Game Fishing In The Pacific

(Continued from page 30)

The cut is then sewn up and the trace led through the mouth, which it is necessary to close by binding it to the leader. The hooks act as a keel and the removal of the backbone gives the fish a limp realistic action when in the water.

A word about hooks. For IGFA rules it is required that no more than two single hooks may be attached to the leader or trace at any one time. These must be attached separately at least a shank's length apart.

Technique Of Big-Game Fishing

The bait is generally trolled from an outrigger about twenty yards from the stern of the fishing craft, and the best position is regulated by the height of the outrigger. The bait should flap on the surface as the launch makes a speed of between five and six knots.

There are many variations in rigging of baits. Some are used on paravanes with a tripping device to free the line when a strike is registered.

It is frequently possible to see a marlin surfacing to "bill" a fish bait. This it does by attempting to stun the fish with its sword. When this happens the line is pulled from the outrigger. The angler immediately throws the reel into free spool while counting up to twelve in seconds. This drop-back is given so that the fish is able to take the bait properly and without hindrance. At the end of this period the angler throws in the reel clutch, hefts the rod to feel if there is weight, and then strikes the hook home by jerking the rod tip several times. With an artificial lure, the hook should be set immediately following a strike. From then on it depends on the angler as to which way the fight goes.

The boat captain meanwhile eases the speed of the boat and carefully watches both the line and angler. If the fish is hooked every effort should be made to take the strain off the line and to manoeuvre the craft so as to lend every assistance to the angler. The mate should assist in swinging the fishing chair so that at all times the angler faces the fish. Time and many encounters with game fish will give the boat captain the necessary experience in this work.

When the fish has been worked alongside the boat for gaffing, a detachable gaff not exceeding eight feet in length may be used for boating of the fish, but the length of the rope or wire attached to the head of the gaff must not exceed thirty feet.

No person other than the angler is allowed to touch any part of the tackle or reel during the playing of the fish, and only one person is allowed to hold the leader or trace while the fish is being gaffed.

In areas where a government-tested scale is not available for the weighing of the fish, a careful testing of the scale by the weighing of objects of known weight is suggested. The weighing of the catch on several scales and the submission of the resultant set of figures is also desirable.

There could be wonderful scope for big-game angling and charter-boat fishing in any of the South Pacific territories where it is known that billfish can be caught in numbers. A record fish could well mean an influx of big-game anglers from all over the world.

Sago Making In Western Papua

(Continued from page 57)

less shapeless. Those intended for barter, however, are prepared with particular care. In New Guinea, the natives hollow out cylindrical holes in the fibrous residue left from the washing process and line them carefully with green *Metroxylon* leaves. They then heap the fresh starch into the hole, using it as a mould; then, wrapping the leaves over the top, they remove the package and bind it fast.

PACIFIC READING

Material in this section is contributed by the South Pacific Commission Literature Bureau. Any enquiries relating thereto should be directed to Box 5254, G.P.O., Sydney, Australia.

Notes and News

Bureau's New Address. The Literature Bureau has moved from its former location at Cremorne to more conveniently situated premises in Sydney. The new office is located in Dalton House (3rd Floor), 115 Pitt Street, Sydney; telephone 28-2791. All correspondence should be addressed to Box 5254, G.P.O., Sydney. We are always glad to see visitors from the islands, and cordially invite them to visit the Bureau when in Sydney.

Nutrition Flannelgraphs for Netherlands New Guinea. In co-operation with the Netherlands New Guinea Medical Services, the Literature Bureau has just completed the production of a series of nutrition flannelgraph pictures. Comprising some 65 different drawings, ranging from simple one-colour line illustrations to 4-colour layouts, these flannelgraph pictures show the essential food requirements at five different stages of a child's first two years. The illustrations were prepared from rough layouts supplied, and the Bureau arranged all production details.

As the traditional methods of colour printing can be very expensive, especially when several colours are involved and only a small print number is required, the Bureau devised varying techniques to keep costs to a minimum. Pre-shaded film was used extensively where screen effects were desired, and the actual colour printing was done by using a combination of metal plates for the key outline colour and paper duplimats for the solid colour effect.

The result is a clear bold colour effect, ideally suitable for flannelgraph work, but which also could be readily adapted to suit practically any type of colour illustrations where low cost is of paramount importance.

A selection of the nutrition flannelgraph cards produced by the Literature Bureau for Netherlands New Guinea.

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Sample copies of these colour illustrations with details of production costs are available from the Literature Bureau, Box 5254 G.P.O., Sydney, N.S.W., Australia.

Assistance to Territories. During the past year an increasing number of requests for information or assistance in producing various booklets required for use in the islands has been received by the Bureau. In each case the Bureau has been able to advise the Administration or mission concerned as to the most suitable and economical method of production, of probable production costs and where necessary offer technical assistance in having the materials printed. The covers of three such recently-completed publications are shown in the accompanying illustration.

The covers of three publications recently produced by the Literature Bureau for territories.

Apart from their obvious value to the Administration concerned, we feel that these books will also be of considerable interest to other territorial administrations, missions and educationists in other areas of the Pacific as examples of low-cost printing techniques using the multilith offset process. These books have been printed on equipment similar to that being installed in the Commission's Literature Production Training Centre at Honiara, and are indicative of the possibilities and scope of this type of equipment in producing the reading and educational needs of the islanders.

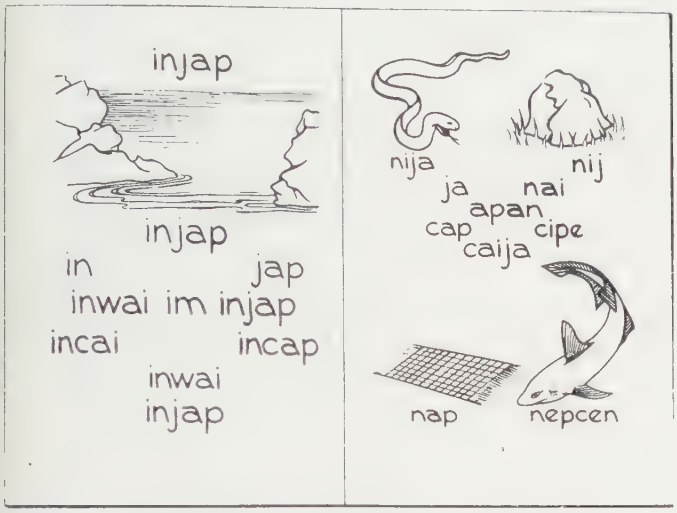
OUR ISLAND HOME is the title of a small social studies book produced by the Literature Bureau on behalf of the Education Committee of the Presbyterian Church of the New Hebrides. Written in simple English at about Standard VI level of English, this book is intended to provide school children with a simple introduction to their own homeland —the New Hebrides. The basic text was prepared by the Education Committee, while the Bureau undertook the preparation of suitable illustrations and arranged all production details.

Attractively produced with a three-colour cover (blue, green and yellow), this book contains 32 pages measuring 6 in. wide x 8¼ in. deep. The text is divided into nineteen chapters and covers such topics as: First Inhabitants; Early Explorers; The Government; Missions and the Church; Schools; Hospitals; Villages; Towns; Things We Buy; and Things We Sell.

The text has been set up on an electric typewriter and is illustrated with 31 two-colour (black and green) line illustrations. A detailed map of the New Hebrides printed in black and white on a green background is featured across the two centre pages of the book.

Although primarily intended for use in the New Hebrides, it is felt that this book could also be useful in other areas of the Pacific.

NITAASVITAI 1 is a first school primer reader produced in the Aneityum (New Hebrides) language. The text was prepared by Dr. A. Capell at the request of the British National Service, New Hebrides, and the Bureau arranged production. To avoid heavy typesetting costs the text in this 40-page booklet was hand-lettered and is illustrated with suitable line drawings by the Bureau's artist. The cover is printed in black on a bright orange board. Two typical pages from this book are shown below.



Typical pages from the Aneityum primer/reader.

THE WOMEN OF MAMAYANG is the first of a series of Women's Club booklets being produced in co-operation with, and on behalf of, the Department of Native Affairs, Port Moresby. In this instance the text and illustrations for English and Pidgin editions of the book were prepared by one of the Department's Women Welfare Officers, and the Bureau simply arranged for the production. This booklet tells in simple narrative form how the Women of Mamayang form a Women's Club and then work together to transform their once dirty and unhealthy village into a clean, healthy environment. The text was set up on the Bureau's electric typewriter and then printed by a small modern offset machine.

Specimen pages of these books with details of production costs are obtainable on request from the Literature Bureau, Box 5254, G.P.O., Sydney, N.S.W., Australia. We shall also welcome enquiries from territorial administrations, and missions interested in the production of similar booklets.

Wealth From The Coconut. Practical methods for improving the quality and yield of coconut plantations are described in this book, which is simply written and well illustrated.

Topics discussed include: Selection of Mother Palms; Selection of Seed Nuts; Coconut Nurseries; Selection of Seedlings; Planting Distance and Preparation of Seedling Holes; The Transplantation and Care of Transplanted Seedlings.

Wealth From the Coconut is available in eight languages—English, French, Fijian, Samoan, Tongan, Pidgin, Maori (Rarotongan) and Malayan.

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All these books are recommended as supplementary reading to The Oxford English Course for Papua and New Guinea Sixth Book, The Oxford English Course Reading Book Three, and The Oxford English Course Alternative Book Four.

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346 LITTLE COLLINS STREET MELBOURNE

Polynesian Journey

(Continued from page 41)

education of the village with regard to hygiene.

Though I visited the Education Department, my work was with the Health Department and the Women's Health Committees in the villages. Half the time was spent in workshops for the nurses, teaching them health education methods and ways of developing their teaching aids.

Meeting Of Women Health Workers

On the last Friday of my stay we had a big meeting of all the nurses and all the Women's Health Committees. Governor Peter Coleman graciously consented to open the meeting and to address the group. A number of High Chiefs and representatives from the legislature attended.

Most of the morning was spent in discussing the role of the Women's Health Committees and in giving some instruction in skin diseases and nutrition, to demonstrate what the nurses had been learning. Then we had a very memorable feast, and following this were entertained by the Women's Health Committees from the various districts. A number of special songs had been composed for the occasion, often about health matters and there were dancing and miming as well.

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I left Pago Pago by air the following Monday, and once again via Western Samoa and Fiji returned to Nouméa and Commission headquarters after an absence of three months.

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Campaign Against Prickly Pear In New Caledonia

USING the scale insect *Dactylopus,* a campaign to eradicate the prickly pear cactus *Opuntia* sp. which infests the range lands of New Caledonia is now in progress. It is following the pattern of similar campaigns in Australia and Hawaii, which were highly successful.

The Entomology Department of the French Institute of Oceania in Nouméa has received from Hawaii living colonies of *Dactylopus* and is rearing and releasing them in infested areas in New Caledonia.

The insect is restricted to its host; so much so, in fact, that it is unable to live on some of the other closely related species of cactus.

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18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
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PUBLIC HEALTH

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34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
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123. **Co-operatives in the South Pacific.** (Report of the SPC Technical Meeting on Co-operatives held at Port Moresby July 21-August 1, 1958.) February 1959.

COMMUNITY DEVELOPMENT

11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** Howard Hayden, Director of Education, Fiji. May 1951.
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15. **Libraries for Beginners.** Dr. and Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July 1951.
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6. **A Preliminary List of Economic Plants of New Caledonia.** J. Barrau Director of Agriculture, New Caledonia. July 1950.
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